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PITTONIA.

A SERIES OF PAPERS RELATING TO BOTANY AND BOTANISTS.

BY

EDWARD L. GREENE.

VOLUME V.

Plates 13, 14.

WASHINGTON, D. C.

1902-1905.

Mo. Bot. Garden
1906

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Vol. V. Part 26

PITTONIA.

A Series of Botanical Papers

BY

EDWARD L. GREENE,

Professor of Botany in the Catholic University of America,

WASHINGTON, D. C.

September–November, 1902.

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National Museum,
Washington, 24 July, 1905.

Dear Mr. Trelease.—

According to my records, you are one of several who never responded to my circular of three years ago (a copy of which I now enclose); and so your Institution is not on the subscription list for vol. V of _Pittonia_.

I withheld part 28 in all these cases, to make sure that I had not erred in sending them parts 26 & 27.

At Chicago it was explained that the circular had never been seen; that they were all in Europe at the time, and did not know.

Part 28 was mailed you as soon as your letter came.

This completes vol. v, all but indexes, title page, etc., which are not yet quite ready. I have receipted the bill for the volume, to save bother of mailing it back, and forth again.

If there is any mistake as to this bill, do not hesitate to say so. In my forgetfulness, I have, in two instances, sent bills that proved already to have been paid long before!

Yours Very Truly
Edw. L. Greene.

PITTONIA.

At the conclusion of the fourth volume of PITTONIA I was resolved, in view of the considerable loss of money involved in a publication distributed so almost gratuitously, to discontinue it, and said so to several of my friends. The appeals that have since come, for its continuation, from various botanists in several parts of the world, have induced me to offer still another volume; and an instalment of Volume V will soon be ready. The price of Part 26, will be One Dollar. The publication will no longer be given in exchange, and will be sent only to such institutions and individuals as shall be enrolled on a new subscription list. The price of the whole volume will be Three Dollars. Nevertheless, as we make no promise to complete the volume within a year, it will be as well that only the price of Part 26 be sent in advance.

EDWARD L. GREENE.

CATHOLIC UNIVERSITY,

WASHINGTON, D. C., 14 *August*, 1902.

New or Critical Species of Acer.

For about a half century past, it has been the received opinion that certain maples mostly of low and bushy habit, occupying our western mountain districts all the way from the borders of Mexico to Alaska, and from the Rocky Mountains to the Pacific, were all to be referred to one species, *Acer glabrum* of Torrey.

That view has long seemed to me unsupported; and a somewhat careful examination of the copious material in my own herbarium, supplemented by that of the Canadian Geological Survey, has convinced me of the thorough validity of Hooker's *A. Douglasii.* An inspection of some originals of Nuttall's *A. tripartitum* preserved in the herbarium at the New York Botanical Garden, has led to the reinstatement, in my mind, of that species. Certain others are here to be named and defined as new.

A. subserratum. Evidently more than a mere bush, doubtless a small tree, the long wand-like branches with a smooth dark-red bark, the internodes 3 or 4 inches long; leaves of broadly ovate-trigonous outline, 2 to 4 inches long, nearly as wide, broadest in the middle, truncate at the broad base, not deeply 3-lobed, the lobes triangular, the middle one twice or thrice as large as the others, the whole margin rather evenly serrate-toothed, petioles slender, about as long as the blade; peduncles and pedicels of about equal length in fruit and the whole little surpassing the petioles: fruits 3 to 6, their wings (in half-grown state) little divergent, the sinus between them oblong.

This species, as to my herbarium, rests on a part of Mr. Heller's n. 3,089 from Lewiston, Idaho, 20 May, 1896, the specimens showing foliage nearly full grown, and tolerably well developed though immature fruit. The species excellently

Pittonia, Vol. V. Pages 1–32. Issued 9 Sept., 1902.

marked by a peculiar cut and indentation of the leaves; for the three lobes are as it were terminal, and the margin displays an evenness of subserrate dentation not seen in any of its allies. It is related to *A. Douglasii*, Hook., an inhabitant of the same region, though widely distributed; but that has a 5-lobed leaf, the lobes radiating, as it were, and their base is subcordate, while as to the margins of the lobes they are more coarsely and unevenly or doubly subserrate-toothed.

A. TORREYI. Less arborescent than the preceding, the stems apt to be tufted and bushy, branches slender and with smooth red bark, the internodes 1½ to 3 inches: largest leaves seldom 3 inches long, about as broad, mostly 3-lobed, occasionally with 2 small lobes developed, the base of the leaf seldom truncate usually subcordate, broader than long, the middle lobe not much larger than the other two, somewhat cuneate-obovate with 3 to 5 secondary shallow lobes and these with a few incise eeth: fruits usually 1 to 3, sometimes 5, diverging to form a broadly V-shaped sinus, or even more widely divergent.

Shrub of the Californian Sierra at middle altitudes; easily distinguished from the Rocky Mountain *A. glabrum* by its comparatively broader leaf (broader than long) and relatively longer lobes, the whole much less deeply incised.

A. DIFFUSUM. A low diffusely branching subalpine shrub. occasionally several feet high; sterile shoots slender and straight, with internodes twice exceeding the small leaves: foliage mostly trifoliolate, the leaflets cuneate obovate, ½ to ¾ inch long, coarsely toothed, the slender ascending petioles often an inch long or more: linear-oblong sepals and petals greenish and striate-nerved; stamens very short: fruits large, with broad almost oblong wings of nearly equal width from apex to base and strongly divergent.

Known only in specimens collected by myself near the summit of the West Humboldt Mountains, Nevada, 29 July, 1895. The species is noteworthy as being a low intricately branched bush, with leaves almost as small as those of a *Sibbaldia* and somewhat

like them, whereas the fruits are very large, and exhibit a peculiar breadth of wing for a member of the *A. glabrum* group These are either solitary or in pairs or threes, and are very short-peduncled.

A. Neo-Mexicanum. A tall clustered shrub freely branching, the younger branches dark-red, perfectly glabrous, glaucescent; leaves often trifoliolate, as often merely 3-parted or only trifid, the leaflets or segments obovate-cuneiform, deeply and doubly incised, acuminate at apex, in maturity often 3 inches long, on rather slender petioles of 2½ to 5 inches: flowers rather numerous, almost umbellate, the petals commonly only half the length of the spatulate-oblong sepals; fruiting peduncles an inch long or more, little longer than the pedicels; wings of fruit moderately divergent.

My type specimens of this are a good fruiting specimen with well developed foliage from the mountains near Las Vegas, New Mexico, by G. R. Vasey, 1881, and a flowering one from near Santa Fe, by Mr. Heller, this bearing the number 3,525 and being named *A. glabrum.*

The species thus proposed do not, I think, exhaust the topic of possible good segregates of so-called *A. glabrum*; but for the present, let these suffice. The next two new maples are of the group to which belongs *A. circinatum.*

A. Macounii. Of the size, habit, and almost the flowers of *A. circinatum,* but foliage very different, the lobes of the leaf being 5 only, rather longer in proportion and more triangular in outline, radiating around the undivided body of the leaf rather than pointing (digitately) forward from it, both faces quite glabrous even when young; flowers also glabrous, otherwise as in the allied species, nearly.

Chilliwack Lake, British Columbia, James M. Macoun, 14 July, 1901. The leaves of this are smaller than in *A. circinatum,* and are so free from pubescence, that this character along with radiant leaf-lobes (quite as in maples generally) led Mr. Macoun to regard this as near *A. glabrum.* The few specimens are scarcely out of flower.

A. MODOCENSE. Allied to the last, the somewhat larger leaves apparently as constantly 5-lobed and with lobes radiant rather than pointing forward, the surface not wholly glabrous, some soft hairs appearing along the veins in some: flowers rather small, sepals, petals and even the anthers green, or greenish-white; sepals mostly (all the outer ones) merely oval, little exceeding the whitish petals, both sepals and petals sparingly hairy; fruit unknown.

Represented by only some flowering branches, with young foliage, collected near the Warm Springs, Modoc Co., California, 4 June, 1892, by M. S. Baker and Frank Nutting. While the leaves here are almost those of *A. Macounii* the flowers are very notably different; for in both that and *A. circinatum* the sepals are narrow, elongated to twice or thrice the length of the petals, and are of a dark red-purple. In *A. Modocense* they are not only green, but very short for those of any maple at all.

A NEW STUDY OF MICROSERIS.

Ahough the type of this genus is Chilian, the species are most numerous in California. My first critical study of them was made in San Francisco twenty years ago. I proposed then the two new species, *M. attenuata*, and *acuminata*, both of which have since obtained universal recognition.

The researches of three more seasons carried on in that field led to the expression of views that were published in 1886,[1] according to which, out of the heterogenous "*Microseris*" of Gray's *Synoptical Flora, Calais* of De Candolle, and *Scorzonella* of Nuttall were restored, and two new genera, *Ptilocalais* and *Nothocalais* were proposed; while for the genuine *Microseris*, the new discovery was made that its species fell into two natural groups, according as the paleæ of the pappus are triangular and plane, or rounded and cymbiform. In this paper I added but

[1] Bull. Calif. Acad. ii, 41–55.

one more to the list of species; and if during the subsequent sixteen years I have published only two or three others, it has not been for want of unclassified material accumulated in my own and other herbaria, but cheifly because certain specific names long current can not with certainty be applied to any one or another of these species. For instance: the Californian species first made known, *Calais Douglasii*, DC. (*Microseris Douglasii*, Sch. Bip. in Pollichia, xxii–xxiv, 308 (1866); Gray, Proc. Am. Acad. viii. 210 (1873) is so vaguely characterized as to be wholly unrecognizable by the original description, which applies equally well to any one of some ten or a dozen species that are known. It is even very manifest from the several different diagnoses that have been made, first by De Candolle, then by Hooker and Arnot, and lastly by Asa Gray, upon the original materials as preserved in the Candollean and Kew Gardens herbaria, that the species is an aggregate, as existing in the very type specimens. Gray himself still more widely extended it; and I everywhere, even in my *Bay-Region Manual*, have consciously left under that name (just as Gray had done) species with white pappus-paleæ, others showing them straw-colored, and some with paleæ of a dark smoky brown or almost black; and some having glabrous, others variously pubescent paleæ. I am persuaded, and long have been, that such characters as these are of specific value. And, as it is useless, and also very unscientific to use names for species which, however long in use, can not with even any probability of correctness, be applied to any particular segregate, I reject, in this paper, the name *M. Douglasii* altogether. I shall give, first of all, a segregation of the various elements of the *M. Douglasii* of Asa Gray's writings and my own. Several of the names here published, have existed in manuscript, in my herbarium for eighteen and twenty years.

Supplementing the wealth of *Microseris* materials gathered by myself in California between the years 1882 and 1895, and largely retained in my own herbarium, I have before me all that has been deposited in the herbarium of the California Academy. In this I find proof of Miss Eastwood's great zeal and diligence in collecting these plants during recent years. A number of the new

species herein proposed, are founded, as will be seen, on specimens collected by herself only, and in remote or obscure parts of California.

M. MELANOCARPHA. Plant stoutish, a foot high or less: leaves simply pinnatifid into ten or more linear-falciform entire segments, the terminal segment scarcely larger than or different from the others: round-ovoid or even almost subglobose; achenes short, barely two lines long, the outer ones broadest at summit, incurved, densely villous, the others oblong-linear, their ribs slenderly spinulose-serrulate; paleæ of pappus round-obovate, very obtuse, scarcely a line long, almost as broad at the obtuse summit, of a dark smoky-brown or dull-blackish, more or less villous externally, as well as appressed-scaberulous, the whitish barbellulate awn about twice as long.

The exactly typical specimens of this, were collected by myself on the grounds of the University of California, near the library building, 1 May, 1882, and were labelled as new, under the above name, soon after. Owing to "improvements," the plant disappeared from that spot from that year; but a year or two later I again saw it on the hills near the University. Two specimens of the original collection remain in the California Academy herbarium. I think some were sent to Asa Gray at the time. An excellent specimen, closely enough matching these originals, was taken by myself near Midway, in the hills east of Livermore, 3 May, 1895. The species is not otherwise known to me. From its habitat, I hold it almost certain that this plant did not enter into the composition of original *M. Douglasii.* Nor could any author have been likely to omit mention of so noteworthy a character as the dark blackish hue of the pappus-pales.

M. TENUISECTA. As tall as the last, or taller, but slender; leaves more deeply cut into very narrowly linear and widely spreading segments: heads only oval or oblong: achenes more slender, all straight, nearly or quite 3 lines long, the outer much less densely villous, the ribs of the others more shortly and not

spinulosely serrulate: paleæ of pappus of oval outline, a line long, glabrous and straw-colored, but strongly appressed-acaberrulous, the barbellulate awn about 1½ lines long.

Known in only a single specimen; this obtained by myself, somewhere on the plains of Fresno Co., California, in April, 1884, and now in the herbarium of the California Academy.

M. CONJUGENS. Leaves shorter than in the foregoing, deeply pinnatifid, the segments oblong-linear, obtusish, spreading: scapes many, 8 to 12 inches high, heads ovoid: achenes slender, 2½ lines long, between columnar and fusiform, all being slightly narrowed under the summit as well as above the base, the outer ones very rarely villous, but always smooth (lacking the ribs), the others brown and scabrous-serrulate on the ribs; pappus-paleæ 1½ lines long, ovate-oblong, acute under the awn, glabrous, ultimately of a dark dull-brown, the awn paler, 2 lines long.

Collected by the writer, at Byron Springs, California, 24 March, 1889, and near Midway, Alameda Co., 3 May, 1895. This as to foliage and habit closely enough simulates *M. melanocarpha*, and its pappus is almost as nearly black, but the achenes are of quite a different character, in respect to which it makes an approach to *M. attenuata*.

M. LEUCOCARPHA. Decumbent scapes 3 to 7 inches high, at flowering fully equalled by the slenderly pinnatisect foliage; involucres oblong or ovoid; achenes scarcely 2 lines long, linear-fusiform, all glabrous, chestnut-color with darker linear flecks, the ribs only very delicately scaberulous; pappus much longer than the achene, the paleæ oblong-lanceolate, of a clear shining white, glabrous, the awn somewhat longer, barbellulate.

My type of this handsome species is a plant collected at Woodside, San Mateo Co., California, 4 May, 1902, by Mr. C. F. Baker, and to be distributed by him under n. 808. I also provisionally refer to the same, a sheet of my own collecting at Byron Springs in the interior of the State as long ago as 24 March, 1889. This differs from the type only in having slightly villous paleæ. Yet another sheet obtained by me near Midway,

Alameda Co., 3 May, 1895, has paleæ more villous, and also villous outer achenes.

M. BREVISETA. Small and slender, the foliage in reduced plants lance-linear and merely toothed, in other pinnatifid; scapes few, 3 to 6 inches high; involucres somewhat turbinate, achenes short and columnar, less than 2 lines long, the outer densely villous, the others dark chestnut-brown, their ribs rather coarsely and very roughly serrulate; paleæ of the pappus ovate-oblong, longer than the achene, distinctly cymbiform, dull-white, scaberulous, tapering to a very short barbellulate awn.

Collected by myself at San Diego, California, April, 1885, and made a part of my *M. Parishii*, Bull. Calif. Acad., ii, 46; but the type of that species has very different achenes and an almost black pappus. By the form of its involucre no less than by its very short pappus-awn does this species ally itself with *M. platycarpha* notwithstanding its narrow and elongated palea.

M. ALICIÆ. Scapes many, stoutish, decumbent, 4 to 10 inches high, the loosely pinnatifid leaves half as long; involucres round-ovoid: achenes short-columnar, 2½ lines long, the very villous outer ones and some next them more less curved, the glabrous ones all of a light ash-gray hue, their obtuse ribs very slenderly and delicately spinulos-serrulate: paleæ of the pappus round-obovate, very obtuse, barely a line long, villous without and dull smoky-brown; awn slender, scarcely barbellulate, 1½ lines long.

Santa Lucia Mountains, Monterey Co., California, May, 1897, Miss Alice Eastwood. Another ally of *M. platycarpha.*

M. PROXIMA. Near the last but much taller, the scapes few erect from the base and slender: involucres subcylindric: achenes nearly 3 lines long, slender-fusiform, all straight, the glabrous ones of a light chestnut-brown, with acute ribs that are scabrous-serrulate; round-obovate pappus-paleæ villous as in the last, the awn more barbellulate.

This also is known only from Miss Eastwood's specimens obtained at Warthau, Fresno Co., Calif., 11 May, 1893. I could

not unite this and the preceding as forms of one species on account of the marked differences in the achenes, though as to pappus they are quite alike. But the two are different habitally; and the geographical reason for holding them apart is cogent. The Santa Lucia Mountains, and the foothills of the Sierra Nevada opposite are two very distinct climatic regions. Mr. Parish's n. 1902, as in my herbarium, seems to represent *M. proxima* south of the Tehachapi Divide. It is from Elizabeth Lake, Los Angeles Co. Its pappus is rather more elongated than in the type specimens, but it does not otherwise differ.

M. FURFURACEA. Low, the many decumbent-scapes only 3 or 4 inches high and almost equalled by the loosely pinnatisect leaves, the whole plant, even to the involucres furfuraceous and also somewhat villous-hairy: involucres round-ovate achenes less than 2 lines long, nearly columnar, the outer somewhat shorter, white-villous in lines between the ribs, the others brownish, their ribs minutely and closely scabrous-serrulate; pappus of very short deltoid-ovate white glabrous paleæ broader than long, the slender fragile awn more than twice as long, the whole as long as the achene.

Only a single but excellent specimen, collected by the writer near Midway, Alameda Co., Calif., 3 May, 1895. The species may perhaps better stand in another group, near *M. aphantocarpha;* but the paleæ if not cymbiform are evidently concave.

M. OLIGANTHA. Plants small, the leaves mostly narrowly oblanceolate, obtuse and entire or sparingly toothed, some broader and more or less pinnatifid: scapes usually solitary, 3 to 6 inches high, decumbent: involucre cylindraceous, very few-flowered: achenes all very light-colored, the outer lightly villous, the inner with ribs very minutely and obscurely scabrous-serrulate, all about 2 lines long and linear-fusiform; pappus of short ovate glabrous white-paleæ and awn about twice as long.

Near Ashland, Oregon, April, 1889, Thomas Howell, distributed for *M. Douglasii.* I have little doubt that a similar plant

from Vancouver Island, distributed by Mr. Macoun, may be the same, but I have seen no specimens in fruit.

The species next following may be regarded as segregates of *M. attenuata*, though the plants were not known at the time that species was published, and consequently have not affected the diagnosis of it; but several of them since have been referred to it by me as manuscript labels show. They are all at agreement with it as to the attenuation of the achene, which is only partly filled by the seed, the upper portion of the pericarp being vacant.

M. CALLICARPHA. Leaves pinnatifid but not very deeply so, the divisions from triangular to subulate-lanceolate or subfalcate: involucres oval: achenes scarcely 3 lines long, dark chestnut-brown, the ribs sharply serrulate-scabrous, a few of the outer villous; pappus about 4 lines long, the oval and distinctly cymbiform palea dull-brownish, white-flecked with the usual minute appressed scaberulous hair, but not in the least villous, the aun of less than twice the length of the palea.

Known to me only in a specimen preserved in my herbarium, taken out of the Botanic Garden at Berkeley in 1894, and named *M. attenuata*. I can not now recall from what part of California the seeds were derived.

M. PICTA. Leaves narrowly lanceolate, entire, or some with a few coarse teeth or short-lobes: involucres oblong, ½ inch long: achenes 3 lines long, slender-fusiform, rather abruptly narrowed under the pappus and much more than half filled by the seed, white, but with numerous large oblong-linear flecks of black, the ribs very sharply serrulate-scabrous, a few of the outer very villous; pappus 4½ lines long, the palea cymbiform sordid-brown, oblong-lanceolate, the awn one and a half times as long.

Salinas Valley, Monterey Co., Calif., May, 1889, E. K. Abbott; the type in my own herbarium.

M. LEIOSPERMA. Large; the many scapes stout, decumbent: leaves rather coarsely pinnate-parted: involucres very many-

flowered and subcampanulate: achenes scarcely 4 lines long, almost columnar, only slightly narrower from the middle upwards, but this portion vacant, the whole of a light brown approaching straw-color, the usual ribs obsolete and the whole surface smooth, the outer ones more shortly and densely villous than in other species: pappus fully 5 lines long, the dull dark-brown paleæ lanceolate (also cymbiform), strongly appressed-villous but only on and very near the very broad midvein, the awn longer than the palea, rather rigid, nearly barbellate.

Near Antioch, Calif., Mrs. Curran, 1886, the type in Herb. Calif. Acad. Some pretty genuine *M. attenuata* was collected at the same time; but the robust habit and very peculiar smooth achenes mark this rather strongly.

M. PARVULA. Dwarf, as compared with *M. attenuata;* only 2 or 3 inches high, but with long cylindric involucres large in proportion: achenes light-brown, 3 lines long, almost cylindric, the only slightly narrower upper and vacant portion of the pericarp comparatively short; none villous, all with serrulate-scabrous striae; pappus white, the narrower cymbiform palea densely white-villous, surmounted by a subplumose awn of about its own length.

Hill tops near Antioch, Calif., Mrs. Curran, 1883 or 1884. The plant was at first named by me, in the Calif. Acad. herbarium as a variety of *M. attenuata.*

M. PARISHII, Greene, Bull. Calif, Acad. ii, 46, in part, and as to the plant of Parish only. As to the habit, involucre, etc. much like *M. attennata*, but achenes only 2½ lines long, scarcely narrower at summit (though not filled by the seed), and almost colummar; lanceolate paleæ of the pappus glabrous, very dark-colored, as long as the achene itself, and attenuate to a much shorter awn, this little more than a line long.

The originals of my former *M. Parishii*, when all their characters have been duly considered, are seen to represent three species. Dr. Parry's specimen is allied to *M. Bigelovii*, if not, indeed, a form of that species; and my own specimens from

San Diego, with white pappus, have already formed the basis of my new *M. breviseta.*

That subdivision of *Microseris* marked by variously triangular and almost or quite plane pappus-pales does not differ, habitally, from the other subdivisions; but the differentiation of species is more difficult and doubtful. Taking *M. Bigelovii,* the original member of it, as the type of the group, it is certain that it was an aggregate species from the very first; for, immediately upon the publication of so strongly characterized a plant as my *M. acuminata,* I had word from Dr. Gray, who at once recognized its validity, that he had been in possession of a specimen of it even from Bigelow, and that it had entered into the composition of his original *M. Bigelovii.* How many others may have been a part of that species, or what one particular form should be left under that name, I know not. Taking the figures in *Whipple's Report,* plate xvii, representing a villous achene from the outer circle, and a glabrous one from the disk, and their pappus, as typical, it still remains difficult to settle upon a type, so very numerous are the forms making more or less near approach to what these figures seem to represent.

My earliest opinion, formed after several years of field study of them, was that certain smaller plants common on hillsides and dry sandy land generally, were the real *M. Bigelovii,* and that a larger plant, one never seen but along the Bay shores, on sandy elevations amid patches of *Salicornia* and *Cakile,* was to be new. Yet, before I came to the point of publishing I had reversed the opinion, and took the small upland plant for the new one, naming it *M. intermedia.*[1] At present I find myself forced back again to my earliest view, namely, that the smaller and upland plant—my own *M. intermedia*—if not the absolute *M. Bigelovii,* is an aggregate embracing it; and I here offer a diagnosis of the exclusively lowland species, under the name I assigned it in manuscript in the year 1886.

[1] Erythea, iii, 100.

M. CASTANEA. *M. Bigelovii*, Greene, Man. 222, not of Gray. Usually a foot high, not rarely ever taller, the deeply simply and regularly pinnatifid or pinnatisect foliage nearly half as long: involucres hemispherical, more than ½ inch broad: achenes barely 2 lines long, short-columnar, or the yellowish-villous outer ones inclining to turbinate, the others chestnut-color, very smooth to the unaided eye, but the thick ribs under a strong lens obscurely and minutely scabrous; pappus fully 5 lines long, consisting of a lanceolate palea of 1 to 1½ lines long, usually whitish or pale, and a long slender barbellulate chestnut-brown awn.

Confined to sandy elevations among the low salt-marshes of the shores of San Francisco Bay; the type specimens now in the California Academy collected by myself at West Oakland, 10 May, 1883, and near Belmont, San Mateo Co.. 10 May, 1886. The longer and almost columnar achenes, and the long whitish pappus-pales, together with the great size of the plant, upright growth, and peculiarly maritime habitat impel the recognition of the species as distinct from its much more variable and difficult ally, *M. Bigelovii.*

M. INSIGNIS. As tall as *M. castanea*, like it in habit, but leaves (in the only known specimens) narrowly oblanceolate and merely short-toothed; the tall scapes only 1 or 2, the heads round-ovate: achenes of outer series and of disk all alike, and all densely villous in lines (between the ribs), the ribs faintly scaberulous; paleæ of the pappus dark-colored, subulate, scaberulous and often more or less appressed-pubescent, scarcely a line long, entire, tapering to a stout subplumose awn of about 3 lines.

Known only in a single sheet of few specimens preserved in the California Academy, and labelled, in the handwriting of Mrs. Curran, as having been collected by myself in 1886. But this must have been, I think, a mere guess, and a wrong one. I could not have overlooked, in 1886, such pronounced specific characters as are here evident.

M. PULCHELLA. Numerous scapes strongly decumbent, 3 to 7 inches high, the leaves half as high, loosely pinnatisect, the segments narrowly linear, entire, the terminal one thrice the size of the others: involucrcs almost hemispherical: achenes oblong, 2 lines long, the outer minutely and densely white-silky; the others chestnut-color, their thickish ribs either very delicately or almost obsoletely scabrous; pappus-paleæ very short, deltoid, densely white-villous, the whitish awn several times longer and of about the length of the achene, obscurely barbellulate.

This, the most elegant of species as to the beauty of its achene and pappus, was collected by myself somewhat copiously, at a certain point among the hills east of the Livermore Valley, Alameda Co., Calif., 2 May, 1895, and is not otherwise known. It is allied to *M. aphantocarpha*, but is a smaller plant, well distinguished by ihe dense silkness of its minute pappus-pales.

M. A[illegible]TRATA. Also related to *M. aphantocarpha*, about a foot high, the irregularly and falcately cut leaves 8 or 10 inches long; involucres large and many-flowered, hemispherical: achenes oblong-linear, 2½ lines long, only one here and there among the outer series villous-pubescent, all the others very light-colored, their ribs minutely but very sharply serrulate-spinulose: pappus of very small ovate acute dark-colored glabrous or merely scabrulous paleæ, and long tawny awn, the whole quite notably longer than the achene.

This is also from the hills east of Livermore, near Midway, collected by myself, 3 May, 1895. The palea is here much more elongated than in *M. aphantocarpha*, and is rather far from being plane, though not involute as in the other group. True *M. aphantocarpha* occurs in this same region, and of luxuriant growth.

M. STENOCARPHA. Foliage slenderly and almost pectinately pinnatifid, the segments very narrowly linear, mostly straight and nearly divaricate, the leaf as a whole quite surpassing the

flowering scapes and almost equalling the fruiting ones, these 6 to 10 inches high: heads round-ovoid, less than ½ inch high: achenes 1¼ lines long, short-columnar inclining to turbinate, the outer villous somewhat in lines, the others smooth, even the ribs not perceptibly scabrous under an ordinary strong lens; paleæ of the pappus 1 line long, slenderly subulate-lanceolate, remotely serrate-toothed, very thin, the delicate awn nearly 2 lines long, merely scaberulous, the whole pappus chestnut-brown.

Near Byron Springs, Calif., 24 March, 1889, collected by myself; also near Chico, C. C. Parry, 1881.

M. CAMPESTRIS. Near the preceding, like it in size, habit heads, etc., but leaves less narrowly pinnatisect: achenes also in size and form much the same, rather larger, but more villous, the outer with thickened ribs obscurely roughened, those of the inner minutely but very saliently spinulose-serrulate; the pappus distinctive, consisting of nearly white ovate-lanceolate entire glabrous paleæ of a line long, and a tawny barbellulate awn somewhat longer.

The type is from Byron Springs, Calif., 24 March, 1889, collected by the writer. Sufficiently at agreement with it is a sheet of specimens from the same tract of interior plains further south, collected 28 March, 1886, by Dr. T. J. Patterson. I hesitate to refer to it a plant from Stony Creek in the Santa Lucia Mountains, May, 1897, collected by Miss Eastwood; for its pappus-paleæ are shorter, and are serrate-toothed, as in *M. Bigelovii* (i. e. my former *M. intermedia*).

M. COGNATA. Allied to *M. acuminata*, but smaller in all its parts, the decumbent-scapes slender, 3 to 6 inches high: involucres narrowly turbinate: achenes only 2 lines long, linear-fusiform, chestnut-brown, the ribs only delicately scabrous-serrulate; pappus 6 lines long, the paleæ linear-lanceolate, loosely appressed-villous both externally and within, tapering to a barbellulate awn of only about 2 lines' length.

Known only as collected by myself on the plains of the inte

rior of California near Fresno, April, 1884, and at the time referred to my then recently published *M. acuminata;* from which it must needs be held distinct on account of its smoother achenes and villous pappus-pales, this last being a new character for a species of this group.

M. OBTUSATA. Stoutish, low, perhaps sometimes depressed the scapes 3 to 7 inches high, the flowering ones almost equalled by the leaves, these somewhat lyrately pinnatifid, the large terminal segment oval, the others more nearly oblong, all very obtuse, mucronulate: involucres more than ½ inch high, subglobose, the calyculate outer series of bracts uncommonly large for the genus, and imbricate in two or three series: achenes subclavate-cylindric, 2 lines long, the outer strongly villous in lines, the inner with ribs scabrous-serrulate, light brown, flecked with short linear dots of purple; pappus of subquadrate-lanceolate lacerate-toothed translucent but dark smoky-brown paleæ and almost twice longer awns.

Bodega Point, Sonoma Co., Calif., 1899 and 1900, Miss Eastwood. Perhaps also the same, by the same, from Point San Pedro, San Mateo Co., 1899; but this last has darker spotless achenes and a rather different almost entire pappus-pale.

M. MARITIMA. Near the last, larger, but much more slender, commonly much depressed: leaves mostly of oblanceolate outline, the lowest often quite entire, some merely dentate, the greater number pinnatifid, but leaving a large oblong or oval obtuse entire terminal lobe: heads round-ovoid, less than ½ inch high :achenes narrow-turbinate, only 1½ lines long, the outer silky-villous, the others partly with obtuse smooth ribs and partly with ribs more acute and finely scabrous-serrulate; pappus-paleæ ovate-trigonous thin, white, subentire, scarcely a line long terminating in an awn of almost 3 lines.

On open bluffs overhanging the sea at Pacific Grove, Monterey Co., Calif., 27 May, 1895, collected by the writer.

Some Phacelia Segregates

Referring to page 161 of Gray's *Synoptical Flora*, Volume ii, Part 1, it will be seen that the author places in the midst of a group of annual species of *Phacelia* the *P. ramosissima* of Douglas, which he admits, on the testimony of the present writer, to be a perennial. This plant had always been supposed to be, like *P. tanacetifolia* and *P. ciliata* between which was placed, as strictly annual as they. Branches of the plants in the herbaria had more than once been mistaken by hastily and superficial observers, for those of *P. tanacetifolia.* But neither real *P. ramosissima* nor any of its segregates bear any other than a remote likeness to the annual species named, as one sees them growing. The fragments of them that get into collections seem to convey no notion of habital peculiarities of this which must be considered a very well marked group of kindred species. Not only are they tufted perennials, but their stems are excessively elongated and are either strongly decumbent, or assurgent, or even trailing and half climbing over shrubs and bushes or rocks among which they grow.

Soon after the announcement was made of the perennial character of *P. ramosissima,* the late Dr. C. C. Parry proposed the first segregate from Gray's aggregate, under the very apt name of *P. suffrutescens.* This is a Californian seaboard species, and seems to be the only one of the group which exhibits a really half-shrubly stem, the lower part of which always survives the winter and is woody.

The first of the new species proposed is represented in that North California plant, the perennial duration which I was first to note.

P. DECUMBENS. Perennial, the slender stems two feet long or more, decumbent, or even, almost trailing, minutely pubescent

and glandular, simple to near the summit, then divaricately branched, each branch ending in a pair of short almost divaricate circinate spikes: leaves thin and dilicate, pinnate below the middle, above it the pinnæ confluent, all coarsely and somewhat incisely toothed: calyx subsessile, its segments broadly (almost obovately) oblanceolate, tapering below to a narrow linear base, densely villous-hirsute mostly marginally, also glandular, faintly 1-nerved: corolla pale purplish; stamens long-exserted: capsule very small, oval, villous; seeds 2, or often 1 only.

The type of this excellent species is my n. 896, collected near Yreka, California, 28 June, 1876, and distributed for *P. ramosissima.* It ranges southward in Calif. to Lake Co., where it has been collected by Jepson.

P. BIFURCA. Perennial like the last two, but stoutish and rigidly erect, paniculately branched at summit or above the middle; herbage grayish with a close indument of minute sharp hairs from a pustulate base, the stem and branches more sparsely clothed with straight spreading hairs, the smaller of them gland-tipped: leaves narrow and pinnate or pinnatifid, the pinnules oval and incised, the rachis hispidulous; peduncles rigidly ascending, divergently forked, each fork with a pair of divergent spikes: sepals with ovate-elliptic blade longer than the slender basal portion, this very hispid, but the blade not so except marginally, its surface above the middle merely scabrous; corolla short, but the limb widely spreading; anthers exserted: capsule ovoid, villous-strigose; seeds 4, long-oval.

Mountains near Tehachapi, Kern Co., California, 22 June, 1889; collected by the writer only.

P. FASTIGIATA. Perennial, allied to the last, evidently larger, probably several feet high, upright, stout, fastigiately branched; foliage more ample, greener, the lobes broad and very obtuse; pubescence fine and dense, but softer, the hairs not pustulate: peduncles very short or obsolete and the spikes in threes; sepals notably unequal, one much larger than the others, all oblanceo-

late, attenuate to a filiform base, hispidulous throughout; corolla nearly funnelform; stamens exserted: capsule large, more than half as long as the calyx, ovate, acute, 4-seeded; seeds ovate-elliptic.

Known only from some uncertain station in the mountains of Kern Co., California; collected by Palmer and Wright in 1888, and bearing, in my set of that collection, the number 205; probably distributed for *P. ramosissima.*

P. POLYSTACHYA. Near *P. suffrutescens*, probably also suffrutiscent, the stout decumbent stems several feet long, villous-pubescent and softly hispid, somewhat freely branched from above the middle, the branches all short and twice dichotomous, the very short geminate and widely divergent spikes very numerous: leaves half as long as in *P. suffrutescens* and of only half as many pinnæ, otherwise quite similar, sepals spatulate, hispid and with also a close villous short indument: corolla small: stamens exserted.

At Witch Creek, San Diego Co., Calif., R. D. Anderson, 1893. I have always regarded Parry's *P. suffrutescens* of the Santa Barbara region one of the most valid species of the genus, though Gray reduced it; and here, from the border of Lower California, we have its analogue, though a more distinct species by characters of foliage, inflorescence, and of the individual flower.

P. SUBSINUATA. Perennial? slender, pale and subcinereous with a close appressed pubescence, a few short hispid hairs on the branches and petioles and becoming more numerous on the long naked peduncle and pedicels the twice forked cyme: leaves 1½ inches long, of oval outline but deeply and sinuately pinnatifid, the broad lobes rounded, obtuse, entire: spikes very short; sepals oblanceolate, obtuse, finely appressed-pubescent and rather strongly hispid-ciliate: corolla apparently open-funnelform; stamens long exserted.

The only representation extant of this has been in my herbarium for more than fifteen years, awaiting further material; for this is a mere branch with leaves and flowers. It was ob-

tained in the San Rafael Mountains, Santa Barbara Co., Calf., in 1886, by Mr. John Spence. It seems to bear the general marks of that group of perennial species of which *P. ramosissima* is assumed to be the type; yet it is extremely different from the others in several respects.

P. EREMOPHILA. Allied to the last, larger and coarser, with more branched and straggling stem, equally thin leaves, the whole herbage green and almost glabrous; the stems minutely and sparsely hispid with deflexed hairs, the ample and pinnatifid obtusely toothed leaves merely strigulose under a lens: branching of the upper part of the stem divaricate, the naked-peduncled inflorescence of 2 or 3 divaricate branches each with usually a pair of spikes, the rachis and sepals hispid, the latter with elliptic-lanceolate tips narrowed to an almost filiform base but of equal length: corollas nearly funnelform, the short limb little exceeding the sepals; stamens exserted: capsule oval, glabrous below the middle, appressed-pubescent above it, maturing usually 4 long and narrow somewhat elliptical seeds.

West Humboldt Mountains in the Nevada desert, collected only by the writer, August, 1894, also in King's Cañon, near Carson, 30 June, 1902, by Carl F. Baker, n. 1198; but these specimens not quite true to the West Humboldt type.

The species next following are variously allied to such annuals as *P. hispida* and its kindred.

P. CICUTARIA. Annual, erect, not widely branching, 1 to 2 feet high; leaves rather ample, closely pinnate, the pinnæ sessile, those of the lowest incisely cleft to the middle, of the upper merely incise-toothed, all lobes and teeth acute, the whole herbage sparsely hispid, and with short soft dense indurnent underneath: spikes in threes, rather strict, though emphatically circinate at summit, corolla as in *P. tanacetifolia* but paler; stamens exserted: seed not known.

At Knights' Ferry, on the Stanislaus River, middle California, 9 April, 1895, collected by my pupil, F. W. Bancroft. The

specimen was referred provisionally to *P. hispida;* but as to habit and inflorescence it is much more like *P. tanacetifolia*, while in its pinnated and sharply cut foliage it recalls, as does no other of our Phacelias such a plant as *Erodium cicutarium.*

P. HETEROSEPALA. Annual, a foot high, freely branching and perhaps reclining, but with nearly the foliage and the hispid-hairiness of *P. hispida;* the racenes more nearly spicate, both flowers and fruiting calyces subsessile, the latter appearing in one rank instead of two: four sepals very narrowly linear, the fifth in all the upper flowers twice as wide and notably longer, but in the lower flowers developed as an oblanceolate, or even a cuneate-obovate toothed leaf: capsules oval instead of globose, puberulent and sparsely bristly, the seeds of twice the size of those of *P. hispida*, of a darker color and more deeply and distinctly favose pitted.

Iron Cañon, foothills of the mountains of Butte Co., California, Mrs. R. M. Austin, May, 1896. Also apparently the same in Amador Co., Geo. Hansen. A fine northeastern and mountain analogue of the south Californian and coastward plant, *P. hispida.*

P. CRYPTANTHA. *P. hispida* var. *brachyantha*, Coville, Contr., U. S. Herb. iv, 158. In his description of this, as a variety of *P. hispida*, Mr. Coville has pointed out its distinguishing peculiarities as compared with the type of that species, and with a fulness that equals, in value, a specific character. There is therefore no need of another specific character here. The geographical range of the plant is totally separate from that of *P. hispida*, which belongs to the Californian seaboard. It is, moreover, a much smaller plant, as to stature; the spikes and calyces are almost the same, while the very small corolla of *P. cryptantha*, not exserted at all beyond the calyx, would of itself be enough to mark the rank of the plant as a species.

P. COMMIXTA. Annual, allied to *P. tanacetifolia*, but foliage not dissected, scarcely even once pinnate, the lobes broad and ample, incised: spikes many, elongated and strict, mostly in

pairs lateral and terminal, very short-peduncled: largest sepal elliptical, the others nearly linear, all acute, moderately hispid except at tip: corolla small, very little exceeding the calyx; stamens wholly included: capsule round-oval, very villous above the middle.

The type specimen of this very well marked species is one of two specimens sent me by Mr. Parish, form San Bernardino, California, in 1891, under the name of *P. distans.* The other specimen, with its finely cut foliage and short divaricate spikes, may well be what the label indicates; but this other specimen is extremely different, with its broad ample foliage and elongated erect spikes in numerous pairs.

I next subjoin the characters of several species that have been placed, in the herbaria, with *P. Davidsonii* and often under that name. All are annual.

P. Aldersonii. Low, only 3 to 6 inches high; herbage pale and soft with a fine pubescence, hispid hairness wanting: leaves all simple and entire, acutish, 1 inch long, but the petiole much longer, dilated and as it were winged below the middle: sepals oblanceolate, obtuse, softly hirsute: corollas open-campanulate, twice the length of the calyx.

Collected at Witch Creek, San Diego Co., Calif., in 1893, by R. D. Alderson, and distributed for *P. Davidsonii*, from which it is now seen to differ much in foliage, pubescence, calyx, etc.

P. Congdoni. Branched from the base and widely spreading, only very sparingly leafy; herbage almost hoary with a coarse pubescence which is sparse and spreading on the branches, dense and appressed on the foliage; leaves simple, entire, elliptic, short-petiolate: racemes lax, solitary or in pairs: sepals linear, hispidulous, in maturity twice the length of the ovate capsule: corolla campanulate, twice the length of the calyx, apparently light-purple.

Buckeye, Mariposa Co., Calif., 25 April, 1895, J. W. Congdon, who distributed it for *P. humilis*, which it little resembles,

though it has the linear sepals of that species, by which mark, along with others, it is distinguished from its nearest relative, *P. Davidsonii.*

P. NEMOPHILOIDES. Stouter than *P. Davidsonii,* larger, the spreading branches covering an area of 1½ feet more or less; herbage strigose-pubescent, the branches with a more minute soft-spreading and glandular hairiness; leaves all oblong, entire, twice the length of their short petioles, these dilated and flat throughout: long racenes mostly solitary: sepals spatulate-oblong, one of twice the breadth of the others, all hispidulous: corollas ½ inch broad or more, campanulate, apparently white as to all but the upper half of the lobes, which are purple: capsules ovoid, 2-seeded.

Southern California, on the San Bernardino Mountains; distributed chiefly by Mr. Parish, whose more recent specimens are labelled *P. Davidsonii,* var. *grandiflora.* Its large corollas, merely purple-spotted, recall those of certain species of *Nemophila*, and are too unlike those of *P. Davidsonii*, and the calyx, and also the foliage, are different.

The concluding one of this series of segregates is of the group of typical species of the genus.

P. BIOLETTII. Perennial, 2 feet high, leafy at base, the almost naked stem loosely branching, sparsely hispid throughout: leaves thin, 6 or 8 inches long including the slender hispid and rather long peliole, simple and elliptic-lanceolate, or occasionally with a pair of leaflets at base of the main leaflet, this very acute, entire, strigose-hispid on both faces, most so above: spiciform racemes short and rather dense, mostly in threes at the ends of slender peduncles; sepals oblong-linear, small, scarcely enlarged in age, loosely hispid; corolla small, lilac: capsule small, ovate; acute, strigose-pubescent, maturing a solitary ovate acute seed.

Sequoia Cañon (which is, I believe, among the Oakland Hills) July, 1891, F. T. Bioletti. Related to *P. nemoralis*, Greene, but with excellent specific characters, and not known except in a single but fine specimen.

SEGREGATES OF VIOLA CANADENSIS.

To any one actually acquainted, by travel and experience, with the topography and climatology of the territory of the United States, East and West, it will seem incredible that any one native species of violet should really occupy the whole range assigned this one by botanical compilers, that is, from the Atlantic to the Pacific, and from near Hudson's Bay to the borders of Mexico.

More than suspicious that this name as in use covers an aggregate of several species, I have, at intervals during a dozen years past, examined the materials so named in my own and other extensive herbaria, but not until recently with results sufficiently clear to warrant my attempting a breaking up of the presumed aggregate. And even now, while some of the segregates to be proposed are clearly enough defined as species, others are less so; and my work as a whole is somewhat tentative and provisional, as indeed all taxonomic work is, and for generations yet to come must continue to be.

In this group, as in others where the typical species is eastern, one names southern and far-western segregates without fear of creating confusion in nomenclature. The original *Viola Canadensis* was no southern or far-western plant. Yet in even the northeastern States and Canada—the region whence the real *V. Canadensis* was derived—there is some diversity of recognizable and definable forms, and the question, to which of these does that name really belong, is a perplexing one; perhaps not satisfactorily to be answered by any one at this late date. Nevertheless, as our first task must be that of defining *a type* to bear, *in our mind*, the old name, I shall at the outset give the characters of the plant which goes by that name in central New York, where it appears to be more common than elsewhere as far as the collections indicate.

V. CANADENSIS, Linn.? Stems a foot high more or less, from

a stoutish ascending rootstock bearing many coarse-fibrous dark roots: leaves from subcordate-reniform to exactly cordate and rather abruptly though not shortly acuminate, the very uppermost often ovate with a more gradual acumination, all thin, glabrous beneath, obscurely and very sparsely short-hairy above and mostly along the veins; stipules thin, scarious, obliquely lanceolate, acuminate: pedicels in the axils of nearly all the cauline leaves, often hirtellous above under the flower: sepals narrowly linear-lanceolate, not auriculate at base, scarcely even gibbous: petals all changing to purple when dry: capsules puberulent (the ovary even hoary).

This plant, as being so nearly glabrous that Linnæus would have let it pass for glabrous, is probably about what that author had for his type of the species. But there is another and more northerly plant, with herbage of lighter hue, leaves pubescent, at least along the veins, on both faces, flowers rather smaller, and even the sepals pubescent marginally, which may be a more genuine *V. Canadensis;* perhaps not specifically distinct from what I have described above. In view, however, of all the uncertainties, I would suggest that, in case the Linnæan type specimens, which he had from Kalm, should be matched by the northern pubescent plant, and the more southerly one prove distinct, I would provide for the plant here described the name V. EURYBIÆFOLIA, with a specimen in my herbarium, collected by Mr. Tidestrom in Sullivan Co., N. Y., in 1897, for the type; other specimens from Utica, by Dr. Haberer, and from Little Falls, by Rev. Fr. Puissant, agreeing essentially.

I can not distinguish from the New York plant, that which occurs in the southern mountain districts, namely, of Carolina, at least, of the seaward slope of the country. I note, however, that Nuttall had, from Alabama, long ago, what he designated as a *V. Canadensis*, var. *corymbosa*, characterized by five or six flowers corymbosely fastigiate at the summit of the stem. But just such a clustering of the flowers I observe in certain specimens from central New York, collected by Father Puissant, and by Dr. Haberer; and these flowers are either apetalous or with

reduced petals; a stem of this description sometimes arising from the same rootstalk with those having the usual scattered or solitary and petaliferous flowers; so that I see no warrant for accepting a variety, much less a species, with the name *corymbosa.*

There is, however, one southern plant, though from the westward slope of the mountains, which must be admitted to be distinct from true *V. Canadensis.*

V. DISCURRENS. Stems solitary, yet forming somewhat extensive colonies by a system of loosely connected slender horizontal whitish rootstocks bearing at their joints a few slender branching fibrous roots, each stem arising from a thickened and more coarsely fibrous-rooted terminus of the general rootstock: herbage of a light green, remarkably thin and translucent when dry; leaves more rounded-cordate than in *V. Canadensis* and acute or cuspidate-acute rather than acuminate: peduncles apparently 2 or 3 only; petals as large as, and much more broad and rounded than in *V. Canadensis,* scarcely tinged with any purple at first, but before falling changing wholly to a rich rather reddish purple: fruit not seen.

This fine violet, so clearly distinct by its subterranean parts, as well as by form and texture of leaves, and form and color of petals, is known to us only in Mr. Ruth's n. 432 from near Knoxville, Tennessee. The upper face of its foliage has some scattered short hairs, as in *V. Canadensis.* The stipules are small, and not attenuate.

V. RUGULOSA. Stouter than *V. Canadensis,* very erect and rather strict, from a thick suberect rootstock, notably pubescent throughout, least so as to the upper face of the leaves, these in part hairy only on the veins and veinlets, but the lower face, as also the stems and petioles hirsutulous: leaves thickish and somewhat rugose, from subcordate-reniform to very broadly cordate, always broader than long, and the largest nearly 3 inches broad, all closely crenate-serrate, none acuminate but rather cuspidate-acute: stipules triangular, pubescent and ciliolate, greenish and not wholly scarious: peduncles few, not

equalling the leaves: sepals broader and shorter than in *V. Canadensis* and with distinct though small and entire auricles; petals rather small, otherwise much as in *V. Canadensis.*

Species peculiarly simulating *V. pubescens* in both habit and foliage as well as pubescence; and known to me only in specimens distributed by Mr. Sandberg, from "rich woods in Hennepin Co., Minnesota, June, 1891."

V. Rydbergii. Of the size of *V. rugulosa* but of laxer habit like that of *V. Canadensis*, the leaves also thin and not negulose, their veins and veinlets notably whitish, and, on the upper face scabro-hispidulous, but underneath decidedly hirsutulous, with shorter hairs scattered over the whole surface, but the stems glabrous; the broad leaves from subreniform in the lowest, to ovate-lanceolate in the uppermost, all more or less truly acuminate, the largest more than 3 inches broad: pedicels mostly 3 or 4; sepals narrowly lanceolate, not acuminate, not obscurely auricled: corollas much as in *V. Canadensis* though notably broader in proportion to their length.

This is the so-called *V. Canadensis* of the more northerly Rocky Mountains. Mr. Rydberg's n. 2726, is a good type specimen, as is also n. 4354 of Rydberg and Bessey, both from Montana. Scarcely different, though of somewhat firmer foliage, is a sheet obtained by myself at Dale Creek, Wyoming, 30 June, 1896; and Mr. Nelson of Laramie has distributed it from several other stations in Wyoming; while from near Fort Collins, in northern Colorado, very fine specimens were distributed by Mr. C. F. Baker in 1896. The rootstock here is apparently longer by far, and more slender than in *V. Canadensis.*

V. scopulorum. *V. Canadensis*, var. *scopulorum*, Gray, Bot. Gaz. xi, 291. Tufted and somewhat depressed stems only 3 or 4 inches high at petaliferous flowering, the numerous peduncles far surpassing the small subcordate-deltoid leaves, these little more than ½ inch long, wholly glabrous, merely acute; those of later specimens twice as large, and, as to the upper portion of the plant more strictly deltoid but very gradually

tapering to a triangular, entire and very sharp acumination: sepals triangular-lanceolate, obscurely auricled: corolla much as in *V. Canadensis,* but smaller.

My first and early-flowering specimens of this were obtained from the shelves and crevices of a precipice in Clear Creek Cañon five miles above Golden, in May, 1870. Again in 1872, June 10, I collected older specimens showing the later development of the foliage, and young fruit, as well as later flowers, these all petaliferous. These later specimens are 8 or 10 inches high. The species flowers from nearly all the axils, and is therefore much more copiously floriferous than any other of the *V. Canadensis* group.

V. Neo-Mexicana. With the rootstock and the habit of *V. Canadensis,* the stems quite as stout, nearly as tall, rather more sparsely leafy, the leaves smaller, none broader than long, the lowest round cordate and cuspidately acutes, the upper from cordate to ovate, acuminate, mostly glabrous beneath, above scaberulous not only along the veins, but over the whole surface: peduncles short, never equalling the leaves; sepals lanceolate, broader than in *V. Canadensis* and with a not indistinct short rounded auricle; petals as in *V. Canadensis* but firmer, apparently altogether dull-white without change in age or in drying.

Near Santa Fe, New Mexico, A. A. Heller, n. 3645; but also, in smaller form in the Mogollon Mountains, by myself, 20 April, 1880.

V. muriculata. Size of the last but more slender, the leaves much thinner, the lowest on elongated slender petioles, more subreniform cordate, delicately and closely puncticulate on both faces, but the dots on the upper faces, especially of the cauline and uppermost leaves, developing each a short stiff hair, thus rendering the surface muriculately scaberulous: peduncles few and near the summit only, very short: sepals lanceolate, showing very distinct and invariably 2-lobed auricles, the lobes rounded, entire: corolla smaller than in *V. Canadensis,* not

changing color, the petals spatulate-oblong, mostly retuse. Known only as collected by myself in subalpine woods of Mt. San Francisco, near Flagstaff, Arizona, 10 July, 1889. The species is strongly characterized both by the peculiar roughness of the foliage, and by the obcordate-auricled sepals as well as retuse petals.

V. GEMINIFLORA. Rootstocks slender, apparently not superficially seated nor much branched: radical leaves about 3, very ample, the largest 3½ inches wide and 4 inches long, the very earliest subreniform-cordate, the others broad-cordate, cuspidately acute, the cauline also 3 only, one medial, the other two almost opposite at summit of stem, each of these subtending a short-peduncled large flower, both faces of the leaf seeming glabrous, a lens showing traces, on either face, of scaberulous hairs along some of the veins: peduncles of the two flowers equal; sepals nearly linear, not auricled, or at most only obscurely so; petals as in *V. Canadensis* and equally disposed to change color in fading.

Nez Perces Co., Idaho, about Lake Waha, Heller, 20 June, 1896, n. 3281. Very beautiful species on account of its fine large foliage, and almost geminate white-and-purple flowers.

SOME NEW ACAULESCENT VIOLETS.

V. SECURIGERA. Of the *V. papilionacea* group but rather small, at least as to dimensions of leaf, but the petioles of the later and larger greatly elongated, 5 to 7 inches long: lowest and short-stalked leaves broadly cordate and subreniform-cordate, acute, ¾ to 1 inch long and about as broad, the later and large ones 2 to 3 inches wide near the base and much broader than long, 3 lobed but not deeply so, the two lateral (or basal) lobes semi-reniform, the terminal one not quite as large, acutely triangular, the margins of all lightly and evenly crenate, one or more intermediate between the early and late ones cordate-

deltoid; both faces of all sparsely appressed-perbescent: petaliferous flowers not seen, the few apetalous ones on slender and not very short horizontal or ascending peduncles.

In woods near Houston, Texas, 17 April, 1900, B. F. Bush; the specimens distributed for *V. Langloisii*, to which species this makes no near approach in any way. The foliage is of most peculiar outline, and might be described as narrow-reniform, with a large apical cusp.

V. AUSTINÆ. Related to *V. cognata* of the Rocky Mountains, but the slender rootstocks branching and the plants therefore tufted; both shorter as to stature and leaves and flowers larger; herbage light-green and altogether and unvaryingly glabrous: leaves mostly subreniform-cordate, at time of petaliferous flowering 1 to 2 inches broad, the length rarely 1¼ inches, abruptly tapering to the petiole, obtuse, evenly crenate: peduncles equalling or slightly exceeding the leaves, bibracteolate a little below the middle: sepals lance-oblong and linear-oblong, obtusish; corolla commonly an inch wide, petals blue, spatulate-oblong, obtuse, all nearly equal, the lateral pair only scantily bearded, or apparently sometimes not at all so: fruiting peduncles of the late apetalous flowers erect, shorter than the petioles, their capsules about 5 lines long.

Subalpine in the Californian Sierra, the best specimens of petaliferous plants being from Mrs. Austin, Butterfly Valley, Plumas Co., 1876. The late summer state, with capsules from apetalous flowers, known only in a sheet collected by my former pupil, Mr. Milo S. Baker, in Big Valley, Lassen Co., 3 July, 1893. At the time of my proposing the *V. cognata* segregate from *V. cucullata* I placed these Californian and some other Pacific coast forms tentatively under *V. cognata*; but in the light of additional material I see cause to separate them.

V. GALACIFOLIA. Slender rootstocks more or less multicipitous and the leaves and peduncles consequently tufted, 4 to 6 inches high at petaliferous flowering, slender, of thin texture

and glabrous: lowest leaves subreniform-orbicular, 1½ inches broad and of the same length, the broad rounded lobes showing a V-shaped sinus, the later ones on much longer petioles, only slightly larger, more inclining to the cordate in outline and somewhat cucullate, the margins of all beautifully crenate, and all obtuse; sepals triangular-lanceolate, acutish; corolla rather more than ¾ inch broad, deep-blue or violet; lateral petals rather scantily bearded.

This exists with me only in a sheet of fine specimens from the "Banks of north Pine Creek," eastern Oregon, collected by Mr. Cusick, 30 May, 1898, and sent under the very erroneous name of *V. Howellii.* It seems related to *V. cucullata*, *cognata* and *Austinæ*, but has peculiarly rounded and crenated foliage, and, I dare say it does not inhabit swampy or boggy places, as do all of those named.

V. SUBJUNCTA. Tufted leaves and peduncles 3 to 5 inches high, from what seems like the branched crown of a taproot rather than a rootstock: herbage not fleshy, wholly glabrous: lowest leaves subcordate-reniform, an inch broad or less, the later and larger ones broadly cordate-ovate, cucullate, all lightly and subserrately crenate: peduncles slightly exceeding the leaves, not very slender, minutely bibracteolate at about the middle: sepals oblong-lanceolate, obtusish: petals narrowly obvate-spatulate, obtuse or retuse, the odd one obviously shorter than the others, the laterals with apparently a dense though small tuft of hairs, the whole corolla about an inch broad.

The excellent sheet of flowering specimens constituting the type of this very noteworthy species was sent me some four year since, for identification, by Mr. Piper, from along Rock Creek, Whitman Co., Washington. I took it, at the time, for an uncommonly large-flowered and showy state of *V. cognata.* The leaves and flowers, though too large, otherwise seem to indicate that species; but I had, until now, completely overlooked the peculiarities of the underground portion of the plant; where I now plainly see a fleshy root surmounted by a branched crown;

quite the mode of growth usual in caulescent violets, but not otherwise known in any North American acaulescent species.

V. PARNASSIFOLIA. Size of the last, the rootstock similar but petioles and peduncles rather stout and the whole herbage glabrous and somewhat fleshy: leaves all subreniform-cordate, abruptly acutish, within the basal sinus tapering abruply to the petiole, the margin only obscurely crenate: peduncles little surpassing the leaves, bibracteolate near the middle, the bracteoles small but green and ascending: sepals oblong-lanceolate, acute; petals with oblong-obovate limb, the odd one like the others and as long; the corolla as a whole about ½ inch broad.

Distributed from Butterfly Valley, Plumas Co., California, by Mrs. Austin in 1876, under the name of *V. blanda*. But the species is most distinct; the very firm leaves much like those of some *Parnassia* in form and texture; the peduncles and petioles reddish or purplish, as seen in *V. lanceolata* and its nearest allies.

V. ANODONTA. Slender, 3 to 5 inches high at petaliferous flowering, from slender horizontal or ascending white rootstocks: leaves ¾ to 1¼ inches broad, not quite as long, in outline suborbicular, with shallow open sinus at base, or almost truncate at base (the outline then semiorbicular), of very thin texture so very remotely and obscurely crenate as to appear entire, glabrous or with a few scattered hirsute hairs about the summit of the long slender petiole, and the base of the leaf: peduncles almost twice as long as the leaves, bibracteolate below the middle, the bracteoles though small green-foliaceous: sepals broadly oval (more than half as broad as long) and very obtuse: limb of the white petals obovate, the odd one very broadly and almost truncately so and shorter; the corolla as a whole rather more than ½ inch broad.

Known only from the mountains of Fresno Co., California, where it was collected by Mrs. Peckinpah in 1890. Very noteworthy among plants of the *V. blanda* group for its large corol-

las, and their rounded hydrocotyle-like seemingly entire leaves.

V. ACHYROPHORA. Low and with foliage of *V. blanda*, the pale thin leaves round reniform to subcordate reniform, obtuse, obscurely crenate, less than an inch broad, on petioles of an inch or more, at base subtended by a pair of quite large ovate subscarious stipules, these becoming brown-chaffy and persistent at the nodes of the slender horizontal rhizome: peduncles seldom 2 inches high, conspicuously bibracteate above the middle, the bracteoles lance-ovate, obtuse, green and erect: sepals oblong-lanceolate, acute; corolla white (or possibly pale purplish), fully ¾ inch broad, the upper petals oblong-spatulate, the odd one much broader and retuse, all glabrous.

St. Paul Island, Bering Sea, July 18, 1897, James M. Macoun; the specimens distributed under the name of *V. palustris;* but if the flowers were only one-third as large as they are, the plant might pass for *V. blanda*, but for the peculiar chaffy rootstock.

V. ARIZONICA. Related to *V. cognata*, the whole plant as glabrous, but more slender, with smaller leaves, these from cordate-reniform to round-cordate, obtuse, beautifully crenate, about ¾ inch broad, scarcely as long, the slender petioles more than twice as long: peduncles of more than twice the length of the leaves, bibracteolate in the middle: sepals ovate-lanceolate, short and very obtuse; petals purple, large for the plant, all except the odd one with broad rounded limb, that narrower and rather shorter than the others.

At Post Spring, Fort Verde, Arizona, 17 April, 1888, Dr. E. A. Mearns. The type specimens are in the herbarium of the New York Botanic Garden. I do not know other evidence of the occurrence of a violet of the *V. cucullata* subgroup so far to the southwest. The leaves are much smaller, the flowers as much larger, than those of *V. cognata;* and the aspect of the plant, with its long slender pedicels, is peculiar; more like that of my *V. crenulata* of northern New York, though the leaves are not cucullate as in that.

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Revision of Romanzoffia.

This genus was founded more than eighty years since on a species still known only from Unalaska and two or three of the other outlying islands of that far-northern sea. This original species, *R. Unalaschensis*, is so well marked in its character that no one fails to identify it; nor do specimens of other species seem to have become mixed with it in the herbaria.

The second species, *R. Sitchensis*, also first made known seventy years since, and equally a northern seaboard species, appears to have grown in the herbaria to be an extensive aggregate, embracing plants from as far south as middle California, and others from high and comparatively dry mountain ranges and summits of the remote interior.

While in California I came to disbelieve the identity of the Californian so-called *R. Sitchensis* with the original which belongs to a region twelve hundred to fifteen hundred miles northward; but I had not access at that time to the data needful for undertaking the solution of the problem. Since then much has been accumulated; and now, the copious materials representing this genus in the herbarium of the Canadian Geological Survey having been sent me for identification, a series of specimens in which one sees at first glance two or three species hitherto unknown, I have found it incumbent on me to go back to the beginnings of the history of *Romanzoffia*, determine for myself the characters of the original species, in order to be the surer of my ground, and am thus compelled, as it were, to accept a greater number of species than I had at all anticipated.

In the course of these investigations I have made a discovery in *Romanzoffia* corresponding to that made in *Dodecatheon* in 1888,[1] and in *Cicuta* in 1889,[2] and which have long since effected

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[1] Pittonia i, 210. [2] Pittonia ii, 2.

a revolution complete in people's treatment of those genera, namely, that the several species fall naturally into two strongly marked groups upon characters vegetative rather than carpological.

I consider it strange that no author has mentioned it, that the original species of *Romanzoffia*, both of them, are loosely though not indistinctly bulbous at base, by the crowding together of the dilated and fleshy-thickened bases of the basal petioles. The character is well enough brought out in the figure by Bongard, and is as manifest in all the northern and subalpine species. Even the branches, in the more robust species, exhibit at their lower nodes, where a number of leaves develop, the same loose bulb, and it is not to be doubted that in such cases these bulbs at last take root and form new plants.

Only in the Californian species does this bulbous character fail, and it fails utterly; the propagation, except by seed, being effected by means of small axillary bublets, as in certain saxifrages. I think that not one of the three Californian Romanzoffias will be found to be of more than annual duration; the long dry season there, succeeded by a moist cool growing season instead of winter, inducing reproduction by bulblets from year to year, in place of the bulbous-perennial duration of the species subjected to a very long cold winter and a short wet summer.

* *Northern or subalpine species, perennial, loosely scaly-bulbous at the crown and above it.*

1. R. Unalaschensis, Cham. Subacaulescent, the long scapiform peduncles mostly simple and without a leaf, sometimes forked below the middle and with a leaf at the fork, the raceme terminal, short and dense, the pedicels erect: leaves round-reniform or nearly orbicular, with mostly 9 shallow lobes: peduncles, pedicels and calyx hirsute or pilose, also to some extent the bulb-scale-like bases of the petioles, and sometimes the upper face of the rather thick leaves: capsule obtuse, not equalling the calyx.

Species still known chiefly from the Island of Unalaska; and

the best specimens seen are those collected on the British Behring Sea Commissions' Expedition, by Mr. James M. Macoun, at probably the original station, 25 July, 1891 (n. 20,080). If not quite the tallest, this is the most robust member of the genus, and easily distinguished from all others by the short strict very hairy raceme. There are others with calyx nearly as long in proportion to the capsule.

2. R. SITCHENSIS, Bong. Plant often taller than the last, but at least typically thin-leaved, and with slender petioles and peduncles; often loosely branching from the crown and each branch loosely bulbous at base; herbage almost glabrous: leaves more rounded, less reniform, 5 to 7-lobed and the lobes not so shallow, commonly acutish: pedicels elongated, slender, ascending: calyx small, the obovate retuse capsule greatly exceeding it.

To this I am obliged to concede both a greater geographical range, and a wider diversity of aspect and size than I should like. In its original and typical state, as a tall lax slender plant I trace it from the Alaskan seaboard down to Vancouver Island (Macoun, n. 17,028); and apparently also the coast of Washington. In the alpine regions of inland mountains occurs a low condensed wholly acaulescent and distinctly bulbous form which, when I first detected it, on Mt. Ranier in 1889, I named in manuscript *R. bulbosa;* but now, tracing this in the herbaria all the way from the Scott Mountains in northern California (my own n. 997 of 1876), eastward to Montana (R. S. Williams in U. S. Herb.), and northward through British Columbia (Macoun, nn. 8,339; 8, 341; 34, 915) and out to the Alaskan shores (Funston, n. 123; as in Herb. Canad. Surv., though not as in U. S. Herb.), where it passes into the larger and typical state, I see that it can scarcely be maintained in anything more than varietal rank.

I note that the corollas of this species are never so narrow and small as represented in Bongard's plate. They are always as long, and usually twice or thrice as broad as there shown; and Regels' var. *grandiflora* goes with me for nought.

3. R. MACOUNII. Habit of *R. Sitchensis*, but every way larger, the flowering stems 6 to 10 inches long, geniculate and reclining, the racemose branches several; whole plant, and especially the inflorescence, pilose-pubescent, many of the hairs straight and gland-tipped, these extending to the calyx, but more minutely and sparsely: leaves round-reniform, the radical often nearly 2 inches broad, and with about twice the usual number of shallow lobes, but these unequal, all mucronulate; the cauline ones also rather long-petioled, but only 5-lobed and of half the size of the others: pedicels elongated and filiform, in fruit spreading rather than ascending: corolla with a very short tube and a broad campanulate limb, this nearly ½ inch broad: capsule somewhat obcordate, little surpassing the calyx and notably glandular-hairy.

Chilliwack Valley, British Columbia, 29 June, 1901, J. M. Macoun, n. 34, 921. A plant of the low country, growing at an altitude of only 150 feet above the level of the sea, through far inland. The foliage is unlike that of any of the seaboard species in that most of the (nine) primary lobes are partly cleft into two, so that the leaf is 14 to 18-lobed.

4. R. RUBELLA. Lower than the last, also less slender, the scapiform stems only 4 to 6 inches high even in fruit, and floriferous throughout, the pedicels stouter and not spreading, the whole plant of a reddish-purple hue: leaves short-peduncled, rather fleshy, the round-reniform blade an inch in diameter more or less, and with 14 to 18 shallow lobes, nearly or quite glabrous, but the petioles and stem more hairy and more glandularly so than in the last, as also the capsule, this not at all exceeding the nearly or quite glabrous calyx: corolla not seen.

This is Mr. Macoun's n. 34,922 from the Chilliwack Valley, and is of the low country. In habit, and in character of capsule as equalling but not surpassing the calyx, the species recalls *R. Unalaschensis* rather than *R. Sitchensis*, but it is most distinct from both.

5. R. GLAUCA. Nearly glabrous throughout, fleshy and glaucous, the whole plant except in part the upper face of the foliage red-purple: radical leaves reniform, *i. e.*, notably broader than long, about 15-toothed, their petioles less dilated at base, the several cauline also long-petioled, more nearly suborbicular, about 9-toothed or lobed: corolla about ½ inch broad, almost campanulate: anthers notably elongated (linear-oblong) fruit not seen.

Also of Mr. Macoun's collecting in the Chilliwack Valley, 1901, but from an altitude of about 2,500 feet in the mountains. The number on the labels is 34,923. With its purple foliage bluish with bloom, and its large white corollas, it is a beautiful species.

6. R. LEIBERGII. Low, only 3 to 5 inches high, the thin and delicate leaves and peduncles from an unusually firm almost subligneous rootstock, its crown obviously bulbous: herbage light-green, glabrous, none of the slender-petioled leaves more than 5-lobed, some 3-lobed, the lobes of all rather deep, extending to the middle of the leaf and broadly obovate acutish: racemose stem simple, or with a branch axillary to a petiolate 3-lobed leaf, few-flowered: corolla small, open-funnelform: pedicels filiform, ascending in fruit: capsule obovoid, not exceeding the oblong-linear sepals.

Ledges of slate, Cœur d' Alene Mountains, northern Idaho, 4 Aug., 1895, J. B. Leiberg. A singular and delicate species, curiously simulating in habit, some acaulescent species of *Oxalis.* The sheet of type specimens is in the U. S. Herbarium.

7. R. SUKSDORFII. Stoutish and rather rigid but low, only 3 to 5 inches high, bulbous at base; lower half of stem, also the petioles of the basal leaves glandular-hirsute, the latter subreniform and 7-lobed, little more than ½ inch broad, the others more orbicular and 5-lobed or 3-lobed: peduncles very erect, loosely racemose almost from the base; pedicels long, glandular-hirtel-

lous, the calyx even more so: corolla open-funnelform, ½ inch long: anthers oval: fruiting pedicels 1 inch long or more, widely spreading: capsule obovoid, obtuse, little exceeding the sepals.

Damp or wet rocks, Mitchell's Point, Wasco Co., Oregon' April and May, 1884, W. N. Suksdorf. This has the stout rigid habit of *R. Californica*, but is more bulbous than ordinary *R. Sitchensis;* while by its strong pubescence it stands alone in the genus. The type-specimens are in the U. S. Herbarium.

*** Middle Californian species, not bulbous at base; probably not perennial.*

8. R. Californica. Plant from 3 inches to nearly a foot high, with a few scattered crisped hairs on lower part of stems and petioles, otherwise glabrous; flowering stems more or less geniculate and reclining: leaves from more than an inch to barely ½ inch broad, the very lowest subreniform and evenly 9-lobed, the greater number of quite orbicular outline, 7-lobed and with a very narrow or closed sinus, only some of the floral 5-lobed, or 3-lobed: corollas funnelform, ½ inch long: pedicels of fruiting raceme not greatly elongated, divaricately spreading: capsule oblong-ovoid, fully twice as long as the sepals.

Plant of the Californian Coast Range, inhabiting moist ledges looking northward, all the way from San Mateo County to perhaps Oregon; represented in collections of Bigelow, Kellogg and Harford, C. F. Baker and others, and always hitherto referred to *R. Sitchensis*, from which it differs greatly in habit, and conspicuously by its wanting that scaly-bulb-like development at base exhibited by all high-northern and subalpine species; producing instead rather large tubers among the fibrous roots, and occasional small bulblets in the axils of leaves and bracts.

When Menzies, almost a century ago (1793), collected, at Trinity Bay, the first *Romanzoffia* specimens ever seen by a botanist, they must have been of this species, or else of one which is still unknown and undescribed. It cannot have been

R. Sitchensis, no form of which has been found so far south as this, not even in the alpine regions of the Sierra.

For a published figure of *R. Californica* I should like to feel warranted in citing the so-called *R. Sitchensis* of the *Botanical Magazine*, Plate 6109, which, whatever it be, is not *R. Sitchensis.* It has neither the bulbous crown, nor the habit nor the foliage of that species; but in all these points it is like *R. Californica.* That such a plant grew from seeds collected by Tiling at Sitka, as is intimated in Hookers' text, I do not at all believe. Tiling, in his journeyings on the Pacific Coast, was, however, at San Francisco; and there is curious evidence of his having conferred with Dr. Kellogg on the subject of *Romanzoffia.* It is easy to think Dr. Kellogg may have conducted him to one or more stations for the Californian plant that are not much more than an hour's travel from the city, and that seeds of this plant may have got into Europe, and been productive of a part of the "*R. Sitchensis*" plants, derived through Tiling. But seeds of real *R. Sitchensis*, from Sitka, were also carried to Germany by Tiling, as is proven by Regel's figures in the *Gartenflora.*

There seems to be cited by Gray, in the *Synoptical Flora*, a figure of the Californian plant, where, under illustrations of *R. Sitchensis*, he mentions "Pac. R. Rep. iv. t. 25." This has perplexed me; for the plate mentioned is that of a plant far enough from *Romanzoffia.* But Dr. Rose has now arrived at an explanation of it, as a misprint. The "t. 25" should read 125, page 125 being that on which *R. Sitchensis* as collected by Bigelow is mentioned.

9. R. Mendocina. Subterranean parts unknown; rather freely branching stem 8 or 10 inches high; herbage glabrous, but a large woolly bulblet in one or more of the lower axils: leaves large and thin, not in the least reniform, rather of a somewhat obovate-orbicular outline, only 5-lobed, or the uppermost 3-lobed, the lobes of all much broader than long: flowers not

seen: fruiting pedicels slender, spreading: capsules oval, remarkably smooth and shining, not exceeding the sepals.

This in so far as known rests on a single large specimen deposited in the U. S. Herbarium, and purporting to have been collected in Mendocino Co., Calif., in 1875, by G. R. Vasey. Its most obvious mark as a species is that of the foliage. It is the only *Romanzoffia* seen, in which the whole circumference of the leaf may be said to lie beyond the terminus of the petiole; for in all the rest there is a sinus at base of the blade, so that the periphery of it includes more or less of the upper part of the petiole. I have noted in the diagnosis that suggestion of the obvate which is thus characteristic of this species exclusively. On the sheet with this type two smaller specimens are mounted, one on either side, both of which show leaves of subreniform outline, with nine short lobes, or rounded teeth, and short sepals; characters establishing their identity with *R. Californica.*

10. R. SPERGULINA. Crown of the root tuberiferous, but with no hint of the bulbous, the few radical leaves showing no dilatation or thickening at base of petiole; plant very nearly glabrous, diffusely branching, very slender, the branches 4 to 10 inches long and apparently procumbent: leaves all very small, the lowest and longest not exceeding ½ inch broad, suborbicular and with about 7 broad obtuse shallow lobes; those of the branches much reduced, 5-lobed, or even only 3-lobed: racemes long and very lax, the rachis almost filiform and bearing small bracts with bulblets in their axils interspersed among the flowers: pedicels long, filiform, deflexed in fruit: corolla less than ½ inch long, with a distinct cylindric tube as long as the calyx, and an open-funnelform limb: capsule small, long-ovoid, twice the length of the small calyx.

Known only in specimens from Pilarcitos Creek, San Mateo Co., California, collected 20 April, 1895, by Mr. J. Burtt Davy. In a Hydrophyllaceous genus of which the type species so closely resembles a saxifrage that the specimens are often found in the herbaria under *Saxifraga*, this latest new one is

the most remarkable of all, as perfectly imitating those saxifrages in which the flowers are very few and scattering, the absent ones being represented by clusters of bulblets. With its few and irregularly disposed slender deflexed pedicels, this plant distinctly suggests a Spurrey.

Revision of Capnorea.

When some eight years since I moved the retirement of the name *Hesperochiron*, in favor of the earlier and therefore rightful *Capnorea* of Rafinesque, I made no study of the species, admitting only three, the third a rather newly proposed one of my own.

The genus is strictly far-western, having perhaps its center of distribution in that natural region embraced within eastern Oregon and Washington and adjacent Idaho. The zealous collecting that has been done in that still rather new field, during the last decade, and largely under the patronage of the Botanical Division of the U. S. Department of Agriculture, has resulted in the accumulation, at the National Herbarium, of an extensive and valuable series of Capnorea sheets. An inspection of these has convinced me of the existence of several species hitherto unpublished; and I have undertaken, first, to determine the originals of the two species for some years past fully recognized, and second, to make out characters on which the species, few or many, may be established. The first of these tasks is, as usual, the really difficult one.

Capnorea was founded, by Rafinesque, on a plant which Lindley had published in 1824 under the name of *Nicotiana nana*. Both the description and the figure in the *Botanical Register* are so bad as to render it almost incredible, to one who has seen a *Capnorea* growing, that any species of this genus was meant. The corolla, both as described and as figured, is that of a *Nicotiana*, than which no sympetalous corolla can be much further removed than that of *Capnorea*; and that such a caricature

should have been made in the *Botanical Register*, I can only explain to myself on the hypothesis of the authors' having drawn the corolla from a memory warped by the imagination that the plant was, what the collector of the seeds had said it was, a genuine tobacco plant. These are the words: "This curious species of Tobacco was raised from seed sent by William Bird, Esq., from the Rocky Mountains of North America" * * * "Upon the envelope of the seed it was stated to be the kind from which the Indians prepare the finest of their tobacco." If this, in 1823, was a true record respecting the plants now in question, it seems remarkable that neither any of the U. S. Government collectors who have been in the field with the plants, and who are supposed to look into the economic uses of native plants, nor of the several botanists and collectors who are resident upon *Capnorea* territory, have ever mentioned any such use of the herb by the aborigines.

But not only does the early plate represent a plant with the corolla of a *Nicotiana;* the author was, in some unaccountable way, betrayed into describing the corolla as "obscurely lobed," and as having a "plicate" æstivation; both of which statements are altogether false as applied to the plant which I, following the lead of all "authorities," have accepted as the type *Hesperochiron* or *Capnorea.* Rafinesque's name for the genus, by the way, is coined in reference to the real, or supposed, use of the plant as a kind of tobacco; or perhaps rather, as being an actual near relative of the genus *Nicotiana.*

What particular species of the genus was in the mind of the author of that plate which seems so largely fictitious, I find it impossible to decide; and so, am utterly at a loss to apply at present, the Rafinesquian binary name *Capnorea nana.*

The species of the genus seem to fall into two natural groups; those of the one having a corolla with clear distinctions of comparatively narrow tube and spreading limb, the organ as a whole being something between funnelform and salverform, or even quite salverform, when fully expanded; those of the other presenting an almost saucer-shaped corolla,

without obvious distinction of tube and limb, a corolla much resembling that of the ordinary *Nemophila*, to which genus *Capnorea* is now confessed to be allied, though not very intimately.

* *Corolla with somewhat abruptly spreading limb above a distinct tube.*

1. C. CALIFORNICA. *Ourisia Californica*, Benth. Pl. Hartw. 327; *C. nana*, Greene, Eryth. ii. 193 in part, not of Rafinesque. The only plant known to me that answers Bentham's description as to small ovate ciliate leaves, ovate ciliate calyx-segments, etc., etc., is something of a rarity in the herbaria, and is known only from the western slope of the Sierra Nevada, California, Since Hartweg's day among the mountains of the Sacramento, I do not know of this plant's having been collected except at Emigrant Gap, by Marcus Jones, in 1882, and at some station further north in Placer County, by Mrs. M. M. Hardy, in 1893. I know of no California botanist's ever having seen the plant growing. Dr. Kellogg even, who explored these regions in early years perhaps as carefully as I have done in less remote days, seems never to have recognized it. It is an excellent species, and Bentham's account of it is sufficiently clear, as to the characters.

2. C. CILIATA, Greene, Eryth. ii. 193. *Hesperochiron ciliatus*, Greene, Pitt. i. 282. This species, perhaps somewhat local in that remote desert tract of southern Nevada, is still unknown to me except in the type specimen. Its corolla, though small and short, does not seem to be rotate. The species has a new ally in my *C. leporina* of the Mojave Desert.

3. C. WATSONIANA. *Hesperochiron Californicus*, Wats. Bot. King, 281, t. 30, but not *Ourisia Californica*, Benth. Excellent species of eastern Nevada and adjacent California, well enough described by Mr. Watson, though poorly figured. Its leaves

are longer and much narrower than those of its northern allies, being oblong, obtuse or retuse, narrowed to a long linear petiole (probably never broad as in Watson's plate); their surface, and also that of the sepals, is sparingly pubescent with short stiff spreading hairs, these less sparse along the margins, which, however, can hardly be described as ciliate, though appearing so by the projection beyond the margin of hairs, the insertion of which is intro-marginal. The lobes of the lilac-purple corollas are ovate, obtuse, about as long as the cylindric tube.

Good specimens of the species are in the U. S. Herbarium and in mine, from the original station near Carson City (where it was obtained by Watson in 1868), by M. E. Jones, 1897, and C. F. Baker, 1 June, 1902. The latter remarks upon it as "common in moist grassy places about thickets, in King's Cañon, near Carson City." Mr. C. F. Sonne, formerly of Truckee, used to distribute good material of it from that vicinity, and Mr. Austin often gathered it in Plumas County, both these last stations within the Californian boundary, but east of the Sierra Nevada, and therefore in the Great Basin.

4. C. LEPORINA. Rootstock not seen: leaves depressed and rosulate, thick and succulent, lanceolate, long-petioled, glabrous or nearly so, excepting a short hairiness along the margin: large outer sepal ovate, the others oblong or even spatulate-oblong, very obtuse, or some retuse, glabrous except for a short appressed-ciliate hairiness of the margins: corolla with broad subcampanulate tube and short rounded spreading lobes: anthers round-oval; filaments glabrous: capsule large, surpassing the calyx, very villous at summit.

Known to me only in specimens collected by Mr. Parish, in May, 1882, at Rabbit Springs in the Mojave Desert, southern California. The specimens show only a few withered corollas; but I can not doubt that its affinities are with this group.

5. C. STRIGOSA. Perpendicular subterranean stem 1 to 2 inches high from a much longer and deep-seated fusiform root, the

tuft of leaves and scapes large and dense, often 6 inches broad, notably succulent; leaves ovate to elliptic-oblong, obtuse or retuse, with broad flat petiole about as long as the blade, upper face of the latter (in some degree the lower face also) canescent with a short dense strigulose pubescence, this especially dense from near the midvein to the margin, thus appearing very densely short-ciliate: peduncles hirtellous, short, the flowers though large rather far from equalling the leaves: calyx-segments oblong-lanceolate, equally as pubescent as the leaves, but the hairs hirsute rather than strigose: corolla nearly or quite an inch long, the large ovate segments rather longer than the tube, the whole corolla sparsely hairy within, the base of tube more densely so: anthers round-oval, not versatile.

This, the largest species known, is based primarily on a plant of my own gathering, on alkaline flats along the Shasta River near Yreka, Calif., 3 May, 1876. Other specimens were obtained by my former pupil, M. S. Baker, somewhere either in Siskiyou Co., or Modoc; and there is a specimen in the U. S. Herbarium purporting to have been obtained in the "Sierra Nevada, Calif.," by J. G. Lemmon in 1875. There is much uncertainty as to the geographic derivation of Mr. Lemmon's plants in general; but this might have come from far-northward in California, and on east slope of the Sierra. His plant differs somewhat from my type, not only in being still larger; it has almost orbicular large corolla-lobes, and they are wholly glabrous within, whereas those in mine are ovate, and loosely short-hairy.

It is more than possible that such a plant as this of Mr. Lemmon's collecting may have formed a part of Dr. Kellogg's obscure *Hesperochiron latifolius;* for the station "alluvial banks of the Yuba River, subject to annual overflows,"[1] would correspond well enough to the habitat of any of those larger species, all of which inhabit open subalkaline plains which are both moist, and, in summer intensely hot.

That Dr. Kellogg had his species partly from the Yuba

[1] Kellogg, Proc. Calif. Acad. v, 44.

Valley flats, and partly from Cisco, amounts with me to almost positive proof that he had two species confused in his *H. latifolius;* for Cisco and all the region round about is subalpine. Here, he might be expected to find *C. Californica*, and perhaps, in the more elevated and rocky situations; *C. pumila.* And so I suspect that he had in view, under *H. latifolius*, both *C. Californica* and some coarser and larger plant like *C. strigosa;* though as regards the character which he most insisted on, a "glandular" indument, I have been unable to find any traces of such a condition in any member of the genus, and on the whole I must decline attempting, at present, the application of Dr. Kellogg's specific name *latifolia* to any species.

6. C. LASIANTHA. *C. nana* (Lindl.), Raf.? Smaller than *C. strigosa*, the herbage thin, scarcely at all succulent; fusiform root as deeply seated, more slender, as also the one or more subterranean stems arising from it; leaves ovate-oblong or oval, very obtuse, the strigose pubescence very sparse, the ciliation of the margin not dense; petioles slender and elongated, the flowers about equalling the leaves; calyx-segments lanceolate to linear, the calyx with a pubescence more copious and approaching the villous: corolla barely ½ inch long, its ovate lobes often acutish, sparsely pilose within and sometimes also externally, occasionally glabrous both without and within.

Species apparently restricted to the subalkaline low plains of eastern Oregon and Washington and adjacent Idaho, where, however, it is exceedingly common, and collected by all who gather plants in that region. I note the following in the U. S. Herbarium: W. N. Suksdorf, near Dallas City, Oreg., 12 April, 1886, this, however, by no means typical, the herbage rather too roughly strigose, and the corolla in the unusual condition of being quite strongly pilose both within and without. G. R. Vasey, "Washington," 1889, n. 472. Medical Lake, Washington, Sandberg & Leiberg, May, 1893. Crooked River, Crook Co., Washington, J. B. Leiberg, 1894, n. 253, also by the same from Barren Valley, Malheur Co., 1896, n. 2191. Wenatchee Lake, Washington, Kirk

Whited, 1896, n. 66. Swan Lake Valley, Klamath Co., Oreg., 24 May, 1896, E. I. Applegate. Eastern Oregon, W. C. Cusick, 1897, n. 1610.

The distinctions between this and its near relative of northeastern California, *C. strigosa*, are brought out in the diagnosis. Compared with it, *C. Watsoniana*, of the corresponding dry region east of the middle Californian Sierra, is a plant of long and narrow foliage with less distinction of blade and petiole, and a pubescence which, though more copious, consists of much longer and softer hairs invariably; and the calyxes and corollas of the two have their own marks in each.

Of the six species of the genus thus far enumerated, not one of the first five can reasonably be taken as equivalent to *C. nana* (Lindl.), Raf.; for not one of them extends its range to that part of the Northwest which Englishmen of the first quarter of the nineteenth century spoke of as being the region of the Rocky Mountains. But in *C. lasiantha* we have a plant common enough in that part of the Northwest whence, as I think, the seeds of "*Nicotiana nana*" must have come. This would be a good enough argument for the identity of my plant with that were it not true that several other species, as much like that figure as this one is, occur in the same region. The very conspicuous hairiness of the corolla in many specimens, in allusion to which I have made the specific name, is something which should have been observed by any botanist, had it existed in the original. Nevertheless, in a few specimens which I can not exclude from *C. lasiantha* this organ is as glabrous as in that of any species. What is more decidedly against this as representing *C. nana* (Lindl.) Raf. is that it is too large; for Lindley's plant in full flower was only "1 or 2 inches high." That circumstance viewed in connection with some others which I shall name later has repeatedly led me to doubt whether the real *C. nana* Raf. is not, after all, *C. pumila.*

7. C. MACILENTA. *C. nana.* (Lindl.), Raf.? Rather smaller than *C. lasiantha*, as copiously leafy and floriferous, but herbage

not succulent, the leaves remarkably thin, not blackening in drying, 2 inches long or more including the short petiole, ovate to ovate-lanceolate and elliptical, obtuse, sparsely strigose-pubescent on both faces, the margin rather more densely so, yet not obviously ciliate, very slender pedicels not equalling the leaves, hirsutulous: sepals linear-lanceolate, conspicuously hirsute, more finely so than in other species; corolla open funnelform (perhaps in expansion salverform), the lobes narrow-oval, obtuse: filaments attenuate-subulate, the round-oval anthers scarcely exserted from the corolla-tube.

Moscow Flats, Idaho, 12 June, 1894, L. F. Henderson, who remarks that it "grows in drier ground than the other species." His label on what is the type sheet in the U. S. Herbarium bears his number 2747.

This very distinct species might quite as well be taken for the original *C. nana* as the preceding; unless its comparative rarity be construed as against that view. Its leaf is decidedly more like that of the figure.

8. C. INCANA. Dwarf; the short oval leaves with a short and broad petiole, the whole plant, even the pedicels and calyx, canescently villous-strigose: peduncles shorter than the leaves, only ½ to ¾ inch long: sepals lanceolate: corolla small, broad-funnelform; the segments ovate, obtuse: filaments stout, scarcely flattened; anthers round-ovate, erect.

On moist flats near Monida, Wyoming, 16 June, 1899, A. and E. Nelson (n. 5409, as distributed to U. S. Herb., which sheet is the type). Being a dwarf species for even this genus, this was distributed under the name of *C. pumila;* but it belongs to the typical group with funnelform corollas, and is also well marked by its hoariness.

Doubtless to this may be referred a rather less hoary plant, with somewhat longer leaves, distributed by Rev. F. D. Kelsey from Deer Lodge, Montana, June, 1887.

I have no doubt that in all the members of the above group, the underground parts are essentially the same; that there is

always a deep-seated fusiform root, from the summit of which there arise abruptly those branches which we designate as the rootstocks, but which are the proper stem of the plant, albeit producing rootlets from their nodes. Collectors will not take the trouble of digging out these roots, and so only here and there one meets with an herbarium specimen that shows it.

But in the succeeding group, quite as considerable as to the number of species, I am as confident that no fusiform proper root will be found. The rootstocks themselves are of quite another type, being slender, short-jointed, inclining to be horizontal, the short internodes in several of the species becoming thickened in such wise that the rootstock may be described as moniliform. Moreover, these organs whether vertical or horizontal end abruptly, the basal terminus being even thicker than any other part, so that the rootstock has to be described as premorse. But the most obvious distinction of this group is that which I shall proceed to name.

** *Corolla saucer-shaped, or almost rotate.*

9. C. PUMILA (Dougl.), Greene. *Menyanthes pumila* Dougl. MSS. *Villarsia pnmila*, Griseb. in Hook. Fl. ii. 70, t. 157. *Capnorea nana* (Lindl.), Raf.? This little plant, needing not to be described anew, after the full diagnosis, and good figure in Hooker's *Flora*, is montane, and even subalpine. The ascending or half-horizontal posture of the rootstock or root, and the bead-like internodes are well brought out in the plate. The small size of the plant, the cut of its leaves, and also the shallow lobes of the corolla, all suggest that just this plant, as well as, or better than any species of the other group, may have constituted what foundation there was in nature, for that probably more than half imaginary flower credited to "*Nicotiana nana*" by Lindley.

Unless I am here confusing several species, *C. pumila* has a somewhat extended range north and south in several chains of

western mountains. But in the herbaria exist, under this name, the types of several thoroughly distinct species.

10. C. FULCRATA. Closely allied to *C. pumila*, though by no means dwarf, the leaves and peduncles commonly 3 inches high or more: rootstock erect, short and stout, an inch long or less, commonly thickest at the premorse base: leaves apparently not depressed but nearly erect, the elliptical to oblong-lanceolate or ovate-lanceolate blade an inch long or more (the narrow petiole as long), glabrous on both faces, the margin not ciliate, but with a broad line of closely appressed almost silky hairs: peduncles about equalling the leaves: calyx with one broad ovate leaf-like segment embracing the other four, these lance-linear, all obtuse and shortly appressed-silky along the margin: corolla open-campanulate, the lobes broad, deep and rounded, the whole an inch broad in expansion, the undivided portion silky-villous within; anthers oblong-linear, twice as long as usual in the genus, and versatile.

A fine well-marked species known to me in but a single sheet of specimens preserved in the U. S. Herbarium, and purporting to have come from somewhere in the State of Washington, by the hands of G. R. Vasey, in 1889.

11. C. NERVOSA. Near the last, somewhat like it in size, but more slender, the thin leaves obviously of quite another texture; rootstock more branched and root-like, not premorse: leaf with larger elliptic blade distinctly venulose, both faces glabrous, the margin beset with a sparse but rather long silky pubescence: segments of calyx not notably dissimilar, their margins sparsely long-ciliate, the undivided portion usually densely long-villous: corolla an inch broad, open-campanulate, silky-villous at base within: anthers elongated as in the last.

Wet meadows at Moscow, Idaho, L. F. Henderson, 13 May, 1894.

12. C. HIRTELLA. Dwarf; the stout erect premorse rootstock about 1½ inches long, the leaves and peduncles not longer; her-

bage, even to the subequal lanceolate obtuse segments of the calyx, almost hoary with a short hirsutulous or almost hispidulous hairiness; but the ovate obtuse blades of the leaves nearly glabrous beneath: corolla rather narrowly and deeply campanulate: anthers oblong.

Wet prairies of eastern Washington, April, 1880, Thomas J. Howell; the specimens (in U. S. Herb.) labelled *Hesperochiron pumilus;* and of the three, one is indeed good *C. pumila*, the other two representing the above most distinct new species.

13. C. VILLOSULA. Rootstock apparently erect, but elongated at least when young slender and distinctly moniliform: leaves elliptic-oblong, petiolate, glabrous beneath, sparsely strigulose above, not ciliate: pedicels and lanceolate obtuse sepals appressed-villous over the whole surface, but not ciliate: corolla nearly rotate, but deeply lobed, the segments broadly ovate, obtuse, glabrous: filaments stout, little flattened, naked except at the very base; anthers oval.

Near Pullman, Washington, May, 1898, A. D. E. Elmer, (n. 1001 of this collector's set in the U. S. Herb.; the type). By its fine and soft appressed pubescence, and deeply cleft though perhaps quite rotate corolla this species is quite singular.

14. C. CAMPANULATA. Dwarf; even smaller than *C. pumila*, the oblong obtuse leaves loosely hirsutulous over the whole surface, or more commonly only near the margin and there more densely so, appearing as if ciliate by projection of the hairs beyond the margin: sepals ovate to ovate-lanceolate, strongly ciliate with long spreading hairs, some like hairs dispersed over the surface toward the base: corollas small, open-campanulate or almost rotate, the lobes as broad as long and very obtuse: anthers oblong, scarcely versatile on the short subulate filaments.

At 7,500 feet (therefore subalpine) on the North Fork of King's River, California, July, 1900, Hall & Chandler; being n. 550 of their set, as represented in the U. S. Herbarium.

New Species of Cryptanthe.

C. monosperma. Very erect, rather slender and strict, a foot high, leafy up to the middle, thence parting into a few slender rigidly ascending branches ending in a simple or forked lax spike: both stem and foliage rather softly hirsute and without other pubescence: spikes seldom more than 2 inches long in fruit; calyx scarcely more than 1½ lines long; sepals linear-lanceolate, not attenuate at tip, nor spreading, equally stiff-hirsute from base to apex with ascending bristly-hairs, a more short and densely appressed villosity underneath the bristles: nutlet solitary, almost filling the calyx, ovate from a truncate base and acute, the forked groove completely closed throughout, the rounded back sparsely tuberculate and densely scabrous-muriculate, the muriculation not very acute.

My type of this very neat species is Mr. Suksdorfs' n. 180, obtained on the Columbia River in 1885, and distributed for *C. muriculata*. Later, Dr. Gray would have referred it to *C. ambigua* to which it is more akin, and it is from the habitat, nearly, of the original *C. ambigua*, and, in view of Dr. Torrey's remark that, in his plant the nutlets are often solitary, I should like to have felt warranted in taking this for the real *C. ambigua*, but such an assumption could not be made in the face of that other statement that in his plant the nutlet has an open groove divaricately forked at base. The figure of the nutlet represents something certainly very unlike that of what I have here in hand.

C. grisea. Stoutish, almost fastigiately branched from near the base, ½ foot high, both stem and leaves cinereous with a copious stiff-hirsute or almost hispid coat of spreading hairs, and a less copious indument of fine closely-appressed ones underneath: spikes short and subsessile, always in pairs or threes, rather dense: fruiting calyx 2 lines long; sepals lanceolate, his-

pid with deflexed hairs and also villous: nutlets 4, small, about $\frac{3}{4}$ line long, rather narrowly ovate-trigonous, the groove divaricately forked and open, the surface rather strongly tuberculate-roughened, and with the dense lesser and scabrous muriculation very minute, appearing under an ordinary lens as mere white dots.

Specimens from Shasta Co., California, 25 May, 1894, collected by M. S. Baker and Frank Nutting, and distributed as *C. ambigua.* The nutlets of this, as to their ventral-face characters, respond to the figure of those of true *C. ambigua;* but their outline, and tuberculation are very different.

C. SIMULANS. Rather slender, bushily branched from the base or near it, often 2 feet high, the stems and branches only scantily strigose-pubescent, the scattered leaves more so beneath, less so above: spikes lax, in pairs or solitary, often 6 inches long: fruiting calyx 3 lines long or more, narrowly lanceolate, attenuate at tip, appressed villous toward the base, and with some short deflexed bristles up and down the back: nutlets ovate, abruptly blunt-pointed, sparsely low-tuberculate, and very minutely and closely white-muriculate: groove forked at the very base and closed throughout.

Common in the foothills of the Sierra Nevada, California, distributed from Amador Co., by Geo. Hansen in 1896, under n. 1903, as to my set. In habit, characters of inflorescence and calyx the species curiously simulates *C. Torreyana*, while its nutlets, (with a slight difference) are those of *C. ambigua*, and its allies.

C. FALLAX. With much the aspect of a slender *C. muriculata*, less than a foot high, the branches with scattered oblong-linear obtuse foliage and terminating in 3 divergent short and rather dense spikes; stem sparsely villous-hirsute, the foliage as sparingly somewhat strigose, the calyxes with a dense pubescence under the rather few very hispid spreading hairs: calyx-segments lanceolate, short, the tips not attenuate: corolla minute: nutlets ovate-lanceolate from a truncate base, traversed ventrally by

a closed scar, this shortly forked at base, the whole surface grayish, smooth and shining, the back but slightly convex and distinctly sharp-edged.

A very remarkable species in the almost wing-margined character of the smooth nutlets; for the plant has the aspect of that group of species whose nutlets are obtuse all around, and muricate. The only specimen known was collected by myself in the mountains above Tehachapi, California, 22 June, 1889, and was mixed with my duplicates of *C. muriculata* until now.

C. HORRIDULA. Stoutish, mostly less than a foot high, branched from hear the base, the branches either spreading or suberect, but soon parted into mostly 3 suberect long dense spikes; the whole plant rather shortly but densely hispid, fruiting calyxes forming two close ranks on the rachis, the segments short, scarcely twice the length of the ovate-trigonous muriculate brown nutlets.

An ally of *C. muriculata*, but smaller, much more stiffly and densely hispid, and with a mode of branching into long, not divergent but suberect two-ranked spikes. Habitatly, it is more like *C. Jonesii;* from which, again, its strong hispidness and dense spikes separate it. I know *C. horridula* in only two specimens; one from the Salinas Valley, Monterey Co., Calif., collected in 1885; the other obtained in 1889 on the summit of the dividing ridge between the San Bernardino Valley and the Mojave Desert.

A FASCICLE OF NEW COMPOSITÆ.

HELENIUM BADIUM. *H. tenuifolium* var. *badium.* Gray, Proc. Am. Acad. xviii. 108. I know of no other instance in which Dr. Gray allowed a composite with dark-brown or purple disk-corollas to stand as a mere variety of a species with the usual yellow disk. It is not, however, the only character marking this as distinct from ordinary *Helenium tenuifolium.* Indeed,

Dr. Gray made note of the pinnatifid or pinnate-toothed foliage of this plant with the dark-brown disk; but still better than this is a mark which seems not to have impressed him, the importance of which can not well be questioned. There is a stiff uprightness to stem, foliage and peduncles in *H. tenuifolium*, while in *H. badium* not only are the peduncles filiform, long and gracefully bending, the foliage is thin in texture and falcately recurved. More numerous, or better characters for allied species are not often found, than those which separate these.

Thelesperma formosum. Annual or biennial, near *T. filifolium* but more slender, branched from the base, the dissected leaves shorter and the segments though linear not attenuate; peduncles shorter, more numerous, the heads smaller, but rays much larger, light-yellow, the disk-flowers also yellow (dark-brown in *T. filifolium*): outer involueral bracts shorter, more obtuse, much exceeded by the inner and these distinct much below the middle: rays ¾ inch long, nearly ½ inch broad, crenately 4-toothed at apex: achenes slender, smooth on both faces; awns of the pappus less stout, very acute.

The type of this fine and very distinct *Thelesperma* is Mr. Heller's n. 3747 from near Santa Fe, New Mexico, June, 1897. Its very showy pale-yellow rays and yellow disk mark it at first glance as different entirely from *T. filifolium*, and the characters of achene and pappus are very pronounced. The real *T. filifolium* does not occur in the mountain districts of New Mexico.

Vernonia oligantha. Slender, 2 feet high, leafy with broad thin leaves up to the loose cyme of small heads, the herbage green and to the unaided eye appearing glabrous: lowest leaves 4 inches long, the upper half as long, all lance-obovate, acute, tapering to the subpetiolar base, sharply but not deeply serrate, sparsely strigulose-roughened on both faces: involucres hardly 2 lines high, of few ovate-oblong obtuse mucronulate erect bracts, the outermost very small and almost subulate; flowers 6 or 8, three or four times the length of the involucre: achenes (immature) glabrous; outer pappus short and inconspicuous.

In woods at Palmetto, Florida, 30 Nov. 1901, S. M. Tracy.

GAILLARDIA FASTIGIATA. Biennial, 2 feet high, rigidly erect, simple below, branching only fastigiately toward the summit, the branches short, leafy up to the large subsessile head: herbage green, scabro-puberulent: lower leaves not known, those of the upper portion of the stem and of the flowering branches linear-oblong, acute, entire or with here and there a tooth: receptacle alveolate, but neither chaffy nor bristly: rays rather short, coppery-red and yellow: disk-corollas with long cylindric throat and dark-red subulate-filiform segments: paleæ of the pappus lanceolate, each tapering to a long slender awn of nearly its own length, the whole almost equalling the corolla: achenes densely villous.

Sapulpa, Indian Territory, 6 Oct., 1894, B. F. Bush, nn. 324 and 326 of his set as in my herbarium. Very unlike *G. lanceolata*, the name on the labels.

GAILLARDIA LUTEA. Of the size and somewhat the habit of the last, but more cinereously scabrous, the lanceolate cauline leaves obtuse and coarsely serrate as are also even those of the flowering branches, but these branches elongated, erect, ending in a quite distinct naked peduncle under the large head: receptacle not alveolate but developing a few short stout bristles: ray-corollas long and conspicuous, light-yellow, deeply trifid and tapering to a long slender base; disk-corollas yellow, the long tube cylindric, the segments shorter and more strictly subulate than in the last; pappus the same.

Malden, Missouri, 21 Aug., 1894, B. F. Bush, n. 177; also distributed for *G. lanceolata*, a species thoroughly unlike either of these by its short ventricose disk-corollas, and its habit of branching freely, forming a broad bushy though loose tuft, nor does it extend to the range of these proposed new species.

LACINIARIA ELONGATA. Stem slender, a yard high, from a root that is long and subcylindric or somewhat fusiform rather than tuber-like: leaves all deep-green, glabrous, only obscurely

punctate, the lowest a foot long, exactly linear, not more than 2 lines wide, 1-nerved, the upper almost filiform: spike 1 to 2 feet long, very loose: bracts of the involucre oval to linear oblong, those of the latter outline very obtuse and with a narrow scarious and colorless margin, ciliolate but obscurely so, almost as obscurely striate and punctate, except in full maturity: achenes setulose-hairy, as long as the subplumose brown pappus.

In low pine barrens at Pass Christian, Mississippi, Sept., 1876, Rev. A. B. Langlois, whose specimens were labelled by him *L. spicata*; but the real *L. spicata* is a very different plant, its involucral bracts elliptic-oblong (i. e. not broad at summit)' strongly striate, punctate, and colored. And no other species is known with such a root as this new one exhibits.

Laciniaria Langloisii. Allied to *L. pycnostachya*, rather taller, from a smaller tuberous root, the herbage altogether of a pale glaucescent-green, the leaves all broader and only obscurely punctate; spike less dense and more elongated: bracts of the involucre of hard texture throughout, strongly hirsute ciliate, wanting the thin purple tips of the kindred species, yet at summit mucronate and rigidly somewhat squarrose: achenes about 5 to each involucre, shorter and less prominently angled than in *L. pycnostachya*, also more pubescent.

Collected apparently only by the late Rev. Father Langlois, in wet prairies of Acadia Co., Louisiana, 1 Oct., 1895. Very well marked in characters of pale herbage, and wholly firm colorless involucral bracts.

Erigeron commixtus. With the habit of *E. flagellaris*, smaller, less stoloniferous, the leaves relatively broader, some entire, others with one or more conspicuous lobes at base of the blade, the whole plant almost hoary with a stiffly hirsute pubescence, this spreading on the leaves and petioles, retrorse on the stems and peduncles: heads, rays, achenes, etc., much as in *E. flagellaris*.

Cañon of the Limpia, mountains of western Texas, 26 April, 1902, S. M. Tracy and F. S. Earle; also collected by the present

writer, in the same general region, namely, in the mountains near Silver City, New Mexico, 18 May, 1880, and distributed for *E. flagellaris.* The species last named has a rather obscure, fine closely appressed hairiness. That of the new one is so extremely different, that were the plants of the size of a Sunflower or Goldenrod, no botanist would confuse them as one species, were the pubescence the only character. I may remark that true *E. flagellaris* reaches the mountains of even southern New Mexico, where, however, it occurs only in a more elevated biological zone.

ERIGERON TRACYI. Allied to the last but dwarf, only 2 or 3 inches high, densely leafy at base and with no stolons (at least at flowering time): petioles of the spatulate-lanceolate entire leaves shorter than the blade or obsolete; the whole herbage silvery-hoary with a fine dense strigulose pubescence, or this more sparse and spreading on the solitary scapiform peduncle: involucre hispidulous: outer pappus very conspicuous though consisting of only shorter and setiform hairs, the inner of a few very delicate capillary ones.

Davis Mountains, western Texas, Tracy and Earle, 28 April, 1902.

CHRYSOTHAMNUS LEUCOCLADUS. Near *C. elegans,* about twice as large in all its parts, a foot high or more; branches of the season with almost shining white bark, and dull light-green foliage: leaves linear, suberect, coriaceous, 1½ inches long, scarcely twisted, rather faintly 1-nerved, glabrous, or the margin scabrous-ciliolate: heads large (for this group), in dense and rather large corymbose panicles; bracts of involucre in 4 series, carinate-conduplicate, pungently acute, glabrous, scarcely glutinous: throat of corolla cleft to below the middle and the segments spreading; style-tips scarcely more than subulate, hirtellous: achenes cuneate-oblong, rather coarsely appressed-pubescent, the scanty pappus of about the same length.

Collected only by the writer, near Grand Junction, Colorado, 27 August, 1896.

Chrysothamnus pinifolius. About a foot high, branched and woody below, the numerous erect and strict leafy and floriferous branches 6 or 8 inches long, yellowish-green and glabrous, only slightly resinous: leaves about 1½ inches long, very narrowly linear, almost filiform, acute, usually suberect on the branches: heads forming a small thyrsoid panicle at summit of each branch; involucres turbinate, their bracts in 3 series, all glabrous, acute: corollas with clavate throat and short erect obtuse teeth; style-branches short, hirtellous; achenes slender, nearly linear, rather densely appressed-silky.

The type specimens of this ally of *C. graveolens* are of my own collecting at Gunnison, Colo., 1 Sept., 1896.

Chrysothamnus consimilis. With much the aspect of the preceding, the leafy and floriferous branches, inflorescence, and even the almost filiform foliage nearly the same, but the plant commonly 2 feet high; heads longer, the involucre bracts thinner and scarcely carinate-conduplicate, the inner obtusish; corollas rather deeply cleft and the segments not erect, rather widely spreading; style-branches merely barbellate-scabrous: achenes as in the last as to size and form, also appressed-silky but the silkiness shorter.

Species known only as collected by myself, in the desert valley of the lower Humboldt River, Nevada, at Deeth, 7 Aug., 1895. It is most clearly distinguished from *C. pinifolius* of Colorado by the characters of the corolla and of the style-branches.

Chrysothamnus moquianus. Tufted stem and fastigiate almost leafless flexuous branches stout, rigid, yellow-green, a foot high, glabrous, or else the woolliness saturated by resinous exudation, becoming apparent only on old wood: the few leaves barely ½ inch long, linear, recurved-spreading: heads few and large, 5 to 7 in terminal clusters, all on stout, short pedicels; bracts of involucre in 4 series, triangular to subulate-lanceolate, acute, recurved-spreading, softly and viscidly villous-ciliate: corollas with rather short spreading teeth; style-branches long, hirtellous: achenes not seen.

Collected on the Moqui Indian Reservation in northern Arizona, 22 Aug., 1897, by Myrtle Zuck, the type in my own herbarium.

Chrysothamnus virens. Shrub stout, several feet high, both leaves and branches of a deep dull green, neither notably viscid nor at all woolly; leaves about 2 inches long, firm and subcoriaceous, linear, very acute, strongly 1-nerved, but with also a lateral nerve close along each margin, and the upper face rugulose by short tranverse veinlets connecting the medial with the lateral nerves: heads very many, in dense large corymbose compound cymes: involucres short (the corollas twice as long), their bracts in mostly 4 series, all of more or less triangular outline, not carinate, scarcely acute, glabrous, not viscid: corolla-tube not slender, loosely hispidulous, teeth of little more than one-fourth the length of the throat, obtusish, not spreading: style-tips hispidulous: achenes appressed-silky.

Plains of southern Colorado, and adjacent foothills, especially in the upper Arkansas Valley; the type specimens of my own collecting, at Cañon City, 7 Sept., 1896.

Chrysothamnus lætevirens. Larger than the last, often 4 or 5 feet high, the branches and foliage light-green, both glabrous or nearly so, only the inflorescence obviously viscid-resinous: leaves very narrowly linear, about 3 or 4 inches long, acute, attenuate at base and subpetiolate, very distinctly 3-nerved, the midvein depressed, the laterals elevated: terminal flower-clusters ample, corymbose-panicled: involucres narrow and elongated, their bracts in 4 series, all the outer carinate, acute, the inner oblong-linear, obtusish, all very viscid on the back and shortly ciliolate at least below the apex: corolla with short slender tube beset with rather many short incurved pairs and a few long straight slender ones, or these last occasionally wanting; segments rather deep, spreading: achenes very silky.

Plentiful on the plains about Grand Junction, Colorado, collected only by the writer, 27 August, 1896.

Chrysothamnus falcatus. Shrub large, but not equalling the last, the tufts more widely spreading; stem and branches and also the lower face of the linear attenuate and somewhat falcately recurved leaves almost white with a fine dense pannose tomentum; leaves strictly 1-nerved, glabrous above, and even the tomentum of the lower face ultimately deciduous: heads in a rather large and dense corymbose panicle: bracts of involucre in 4 series, all with slightly spreading and almost pungently acute tips, neither obviously viscid nor ciliate: tube of corolla short, pubescent, the throat oblong-clavate, the very short teeth connivent rather than erect or spreading.

Plains about Grand Junction, southwestern Colorado, 27 Aug., 1896, collected by the writer. The species has a very characteristic corolla; and the pubescence of stem and leaves is also unlike that of any other known species, appearing on the lower face of the leaves as an almost rice-papery removable covering.

Chrysothamnus confinis. Of about the size and with the stoutish habit of *C. virens*, but stems whitish, the leaves deep-green and very narrowly linear, pungently acute, 1-nerved, the whole plant more notably resiniferous; bracts of the involucre in 4 series, only the exterior ones triangular, the inmost oblong-linear and obtuse, all obviously carinate and, at least toward the summit, notably ciliate: tube of the corolla slender, sparsely setulose-hairy; teeth short, erect and obtuse: achenes silky.

A species of southern New Mexico, the type being Mr. Wooton's n. 379 (of my set), from the White Mountains, Lincoln Co., 23 Aug., 1897.

Chrysothamnus orthophyllus. Low, only weakly suffrutescent, less than a foot high, the numerous and slender stems crowded, very erect, white-woolly and not in the least viscid: leaves 1½ inches long, narrowly linear, acute, white-woolly, very straight and suberect: cymes of few heads thyrsoidly arranged; bracts of involucre in 3 series, the outer densely cottony throughout, the linear inner ones as much so at tip only, all with erect

obtusish tips: corolla with both tube and tips of the short erect segments long-villous.

This species, so very marked in all its characters, especially in the peculiar hairiness of the corolla tube and segments, I know only as forming part of a collection made in Plumas County, California, as long ago as 1880, by Mrs. R. M. Austin, the only specimens known to me being in my own herbarium.

Chrysothamnus Macounii. Size of the last, rather more woody, the branches fewer and more rigid, more densely obscurely and viscidly white-tomentose, as also the indument of leaves, but these more sparse, more narrowly linear, recurved-spreading: cymes large and corymbose; bracts of involucre in 4 series, all very acute and more or less white-villous, not cottony: corolla glabrous, its segments longer and more or less spreading.

I have this only from near Lytton, British Columbia, where it was obtained by Mr. John Macoun, in August, 1887. It bears some likeness to *C. Plattensis* of the Colorado plains, but has characters enough of its own.

Chrysothamnus tortuosus. Perhaps 2 feet high, the slender suberect and tortuous leafy and flowering branches a foot long or more, tomentulose and somewhat resiniferous, only sparsely leafy, the nearly filiform leaves 2 or 3 inches long, more or less spreading and tortuous, scarcely tomentulose but notably resinous-viscid at least when young: heads in a rather ample subcorymbose panicle; bracts of the rather narrow and elongated involucres in 4 series, all rather pungently acute, very viscid when young, also seemingly puberulent under the exudation, otherwise glabrous: corollas rather deeply cleft: achenes not seen.

My specimens of this are immature, and have long been left in my herbarium unnamed. They are from northern California: one sheet from Plumas Co., by Mrs. Austin, 1880; the other from about 7000 feet on Mt. Shasta, by Mr. Jepson, 4 Aug., 1894. The vegetative characters are so pronounced that I have no doubt about the validity of the species.

Chrysothamnus angustus. Two feet high or more, the stoutish very erect branches of the season fastigiate, very copiously floriferous, each terminating in a large pyramidal thyrsus of middle-sized heads, leaves nearly filiform, 2 or 3 inches long, ascending or spreading, somewhat resinous and canescently woolly: bracts of the involucre in 4 series, scarcely conduplicate, the inner linear-lanceolate obtusish, the outer and shorter acute, all glabrous and somewhat viscid up and down the midnerve: short corolla-tube sparingly short-setulose, passing quite gradually to the throat; segments quite deep, spreading: pappus quite white; achenes appressed silky.

Specimens known only from the half desert plains of northeastern California, in Modoc Co., where they were collected near Alturas by Mrs. Austin, and by Baker and Nutting in "Big Valley," both in the year 1894. By its canescent woolliness, and some other characters, it is to be distinguished from *C. pinifolius* and *C. consimilis*.

New Species of Apocynum.

A. salignum. Related to *A. cannabinum*, evidently smaller, the herbage of a paler hue, and that of both faces of the leaves quite the same: cauline leaves oblong-lanceolate, somewhat acuminate, 3 or 4 inches long, subsessile, the veins in no wise conspicuous; branching not dichotomous, the branches far exceeding the main axis, very leafy, mostly sterile, their leaves elliptic-lanceolate to linear-lanceolate, 2 to 2½ inches long, very acute but not mucronate: the mostly solitary cyme linear-bracted, rather few-flowered; sepals lanceolate, quite surpassing the cylindric tube of the small white corolla.

The only specimen of this, a very willowy-looking plant, with singularly narrow and acuminated foliage, was brought to me from somewhere in Humboldt County, California, many years since; by Messrs. Victor Chesnut and Elmer Drew, at that time my pupils.

A. OBLONGUM. As to hue of herbage, mode of branching, etc., quite like the last, but leaves very different, their outline being precisely oblong, the apex neither acuminate nor mucronate, but cuspidately acute, the base tapering to the short petiole, the proper cauline and those of the branches (these also mostly sterile) much the same as to size, 2½ or 3 inches long, cyme mostly solitary, few-flowered; lanceolate sepals often obtusish, not equalling the tube of the cylindric white corolla: follicles small (2½ inches long).

Species of the interior of middle California; the type being Geo. Hansen's n. 1162 (of my set), collected on the Mokelumne River, at Clinton Bar, in July and October, 1895. In the fruiting state this bears a close resemblance to the eastern *A. album*. A fragmentary flowering specimen sent me from Monterey Co., by Mr. Hickman, in 1886, I now refer somewhat confidently to the present species; also less confidently a good specimen from Piute Creek, in southern California, 1893, by N. C. Wilson.

A. SUKSDORFII. Allied to the two foregoing, and with the same tendency to bear a single few-flowered terminal cyme and many very leafy but flowerless lateral branches, but hue of herbage very different in this and the foliage much more like *A. cannabinum*, the upper face of leaves of a rather vivid green, only the lower pale and glaucous; cauline leaves 4 inches long, often 2 in breadth, elliptic-lanceolate, the lowest subcordate, all mucronately acute: flowers of the small cymes wholly white, even the ovate-lanceolate short sepals as white as the corolla.

I thus name, in compliment to Mr. Suksdorf, an Oregonian species best represented in his n. 1522 (of my set) from sandy banks of the Columbia River. Both the habit of the plant, and its exceedingly few and white flowers forbid its being received as identical with the rank, freely flowering and green-flowered real *A. cannabinum*.

A. LAURINUM. Of the *A. cannabinum* alliance, of a lighter and brighter green as to the upper and glabrous face of the leaves, these at least on the main stem about 3 inches long, oblong-lanceolate,

subcordate at the base and subsessile, at apex acute, though scarcely mucronate, white-veiny above, beneath very pale and with an obvious though scattered pubescence of short curved or curled stiff white hairs, the margin beset with remote but not minute scabrous points; rameal foliage the same, but only half as large; all the branchlets ending in a few-flowered cyme: sepals ovate, spreading: corolla white; not strictly cylindric, even the tube widening slightly upwards.

An excellent species, with its own peculiar leaf-outline (the leaves almost sessile) and a pubescence as peculiar. The ovate sepals another excellent mark. The only specimen seen is Mr. Wooton's n. 113. from the Oregon Mountains, New Mexico, 1897.

A. RHOMBOIDEUM. Allied to *A. androsæmifolium*, quite as large, stouter, canescent with a minute subtomentose pubescence: leaves mostly rhombic-ovate, 2 inches long, 1½ inches broad in the middle, prominently mucronate and petiolate; branches all incurved, their leaves deflexed, the cymes borne conspicuously above them and rather many-flowered: sepals pubescent, wine-colored, of triangular-lanceolate or properly lanceolate outline and acuminate, of rather more than half the length of the rose-red corolla-tube, this broad-cylindric, the oblong-ovate segments rather deep and recurved.

This truly excellent species, though a strict ally of *A. androsæmifolium*, was permitted by me to pass for a state of my *A. vestitum* (which is of the *A. cannabinum* group) in writing the *Bay-Region Manual*. The plant is known only from Napa Valley, California, where it was collected by Mr. Jepson, east of the village of St. Helena, in 1893.

New Species of Eriogonum.

E. reclinatum. Near *E. umbellatum* but notably bushy-shrubby, the repeatedly forked woody stems often a foot high, obviously reclining, usually forming a broad dense tuft; the very numerous slender sterile branchlets tomentulose, ending in tufts of upright (not spreading and rosulate) elliptic-lanceolate and rather slenderly petiolate leaves an inch long, these canescently tomentose on both faces before maturity, afterwards glabrate above, not so beneath: peduncles slender and weak, seldom quite upright, villous-tomentulose, or sparsely villous, or nearly glabrous, the simple umbel with commonly 2 or 3 rays only, sometimes with 4 or 5: perianth greenish yellow, the stipitiform base sometimes as long as the segments, sometimes much shorter.

This forms the bulk of what passes for *E. umbellatum* in the Californian Sierra and adjacent Nevada, and by its vegetative characters alone must be held a good geographical subspecies at least.

E. azaleastrum. Akin to *E. umbellatum*, but strongly suffrutescent, the trichotomous woody stems a half-foot high or more, the red bark smooth on the younger branches, somewhat striate-fissured on the older, the ultimate branchlets sparingly somewhat arachnoid-tomentose, each ending in a somewhat rosulate tuft of small subcoriaceous leaves, these glabrous to the unaided eye, ovate-elliptical, tapering abruptly to a very short petiole, the whole leaf less than an inch long, the margins of the younger showing, under a lens, some flocculent or arachnoid tomentum (but this deciduous), the short petioles pilose-ciliate: stoutish and wholly glabrous scapes rigidly erect, 6 or 8 inches high: simple umbel of about 6 rays subtended by a whorl of deflexed bracts as long as the proper leaves but narrower and of oblong outline: perianths yellow, changing to crimson in age

when much exposed to the sun, the stipitiform base and also the segments much as in *E. umbellatum.*

Black Cañon of the West Humboldt Mountains, Nevada, on the most arid and otherwise barren rocky slopes, 29 July, 1895, collected by the writer only.

E. MODOCENSE. Suffrutescent, but not mnch more so than *E. umbellatum*, the basal leafy branches more rigid and divaricate: leaves not more than an inch long including the petiole, this usually shorter than the round-obovate blade, this densely white-tomentose beneath, as also the upper face of it when young, but this eventually glabrous: scapiform peduncles 4 to 6 inches high, stoutish, rigidly erect, floccose-tomentose; bracts of the involucres oblanceolate; rays of the simple umbel 4 to 7: perianths large in maturity, yellow tinged with red, the segments obovate-spatulate, very obtuse, the outer rather shorter, the stipitiform base scarcely ½ line long.

The type specimens of this are from Davis Creek, Modoc Co. Calif., Aug. 1894, collected by Mrs. L. A. M. Black. Others quite like these but younger are from Mt. Dyer, in the same region, by Mrs. Austin, some of these obtained as far back as 1880. A larger form of what may perhaps be the same was sent by Mrs. Austin from southeastern Oregon, 1893, these specimens though with tall peduncles, are too young and fragmentary to be referred very positively to this species.

E. RYDBERGII. In aspect much like the last, though more largely suffrutescent; leaves as large, but blade elliptic-ovate and shorter in proportion to the petiole, tomentum less dense beneath, also less dense above and scarcely deciduous: peduncles not stout, 3 to 5 inches high, the simple umbels with only 3 or 4 rays and these short: perianth of a light greenish yellow, segments elongated-oval, rounded at summit but not very obtuse, their midveins below and also the 1-line-long stipitiform base granular-puberulent, or perhaps rather resinous-granular.

This, so much like *E. Modocense* in general appearance, yet

so completely distinct by characters of the perianth, I know only in my duplicate of Rydberg and Bessey's n. 5,330 from the Yellowstone Park, distributed for *E. umbellatum.*

E. NEGLECTUM. Of the habit of *E. umbellatum*, and the size, or somewhat smaller, the foliage smaller and of another outline, the blade being nearly elliptical, the decidedly slender petioles longer or shorter, both faces of the leaves glabrous in maturity, not flocculent even when young, except as to the margin and the petiole, and this indument deciduous: peduncles above, and the rays of the simple umbel villous-tomentulose rather than flocculent: perianth yellow, segments more obovate and less obtuse than in *E. umbellatum.*

Collected by myself, on Blue River in northwestern Colorado, 6 Aug., 1875, the situation subalpine. The specimens, long since mounted on a sheet with some of *E. umbellatum*, are always in marked contrast with that species by the different leaf-outline, the almost total want of pubescence, and the distinctly different and villous character of what little hairiness a lens discloses. I do not think the Blue River region has been visited by botanists, except as traversed hastily by myself twenty-seven years since.

E. OVATUM. Resembling *E. subalpinum*, the perianths of the same dull cream color, but stem much more woody, the basal branches stout, rigid, short-jointed, the small foliage in rosettes at ends of branches: leaves coriaceous, less than ½ inch long, ovate, acute, short petiolal, glabrate above, densely white tomentose beneath: peduncles 6 inches high, stoutish, loosely flocculent, naked: inflorescence compound, but the umbels rather short peduncled and crowded: involucral bracts, rays of umbel, etc., silky villous rather than tomentose: perianths, with round-obovate segments and a short stout truncate stipitiform base, this somewhat viscid-granular.

A well marked species somewhat intermediate between such different plants as *E. umbellatum* and *E. heracleoides.* The only specimen seen is from the vicinity of Silver Lake, Lassen Co., California, and was obtained by Messrs. Baker and Nutting in 1804.

E. LONGULUM. Habit and aspect of *E. nudum* but taller, commonly 2½ to 4 feet high, the leaves larger and thinner, 2 or 3 inches long, seldom or never subcordate, but tapering to a slender petiole of 3 or 4 inches, green and glabrous above, not very densely tomentose even beneath, the outline oblong: branches of the tall peduncles not numerous, the involucres correspondingly few, narrowly turbinate, 2½ lines long: perianths greenish-white, the segments elongated-obovate, obtuse, the inner longer than the outer and sparsely hirsute externally from about the middle to the base, a few such hairs extending to the edges of some of the outer ones: achene prominently and obtusely margined at the three angles, and tapering to a beak as long as the body.

Hills and valleys of the inner Coast Range of California, in Lake, Colusa and adjoining counties. This and some other inland plants were made, by Mr. Watson, a variety *oblongifolium* of *E. nudum*, and *E. affine* Benth. was adduced as a synonym. But what I have here in view can not be referred to *E. affine*, which, according to Bentham has not only a pubescent perianth, but also thick undulate-margined leaves with rounded rather than tapering base, a panicle with tomentose branches, whereas here the whole panicle is glabrous and glaucous, perfectly so at all stages of growth.

E. SULPHUREUM. Tall as *E. nudum*, stouter, less freely branching, the corymbose panicle much narrower, the whole permanently floccose-tomentose: leaves an inch long or more, oblong, rather short-petioled, rounded at base, also somewhat tapering to the petiole, densely tomentose beneath, sparsely so above, but permanently: involucres almost cylindric: perianths yellow, the inner segments villous-hirsute below the middle, a few like hairs occasional on the base (the united portion) of the perianth.

Elevated plains of northern California beyond Mt. Shasta; the type being my own n. 923 from near Yreka, 8 July, 1876.

This is the plant which Mr. Howell, Fl. 573, has taken, though with a mark of doubt, for *E. nudum*, which latter truly does not occur within Mr. Howell's limits.

E. OBLANCEOLATUM. Near *E. nudum*, 2 feet high or more, the naked peduncle and its rather numerous dichotomous branches glabrous, glaucescent; leaves thick and firm, the oblanceolate acutish blade 1½ to 2½ inches long, passing very gradually to the petiole, this narrow, mostly 2 or 3 inches long and flocculent, the blade densely white-tomentose beneath, wholly glabrous above: involucres narrow-turbinate, less than 2 lines long: perianths white or pinkish, short, their outer segments round-obovate, not at all tapering below, the inner delicately villous along the midvein near the base.

Foothills of Mt. St. Helena in Napa and Sonoma counties, California, the type specimens by myself, 13 June, 1894. Thoroughly distinct from *E. nudum* by its exactly oblanceolate foliage and broad rounded perianth-segments.

E. DEDUCTUM. Allied to *E. nudum*, equally perennial, much smaller, about a foot high, the pedunculiform branches first forked near the middle, and these bearing often a single scarcely reduced or modified leaf; leaves mostly oval, commonly ½ inch long, seldom longer, glabrate above, white-tomentose beneath, all tapering abruptly to a petiole of about 2 inches: branches several, glabrous, glaucous; involucres turbinate, 1½ lines long; perianths white or pinkish, about a line long, the somewhat cuneately obovate segments obtuse, glabrous.

An almost alpine (never less than subalpine) homologue of the large *E. nudum*, inhabiting the Sierra Nevada of California, and common in collections.

A Study of Euthamia.

Two somewhat solidagineous herbs of eastern North America, closely enough allied in nature, but distributed by Linnaeus, the one to the South African genus *Chrysocoma,* and the other to *Solidago,* were seen by the discerning eye and unbiassed mind of the gifted Nuttall to represent a proper genus. In the year 1818 he published this new thought, assigning to the group the name Euthamia.

Altogether at variance with *Solidago* in habit and sufficiently well marked by several characters; much more nearly at agreement, habitally, with *Gutierrezia,* but necessarily separate from that group by its capillary rather than chaffy pappus, the genus is as definitely circumscribed as either *Solidago* or *Gutierrezia,* and as certain to obtain future recognition as either of them.

When eight years ago I was preparing to reinstate the then long suppressed Euthamia,[1] I became convinced that the list of admitted species was greatly in need of revision; but the usual grave difficulties to be surmounted in the way of identifying the original and typical species of the genus, at the time deterred me. Of success in that direction I am now more confident.

The earliest mention that seems to have been made of any one of these plants is that of the *Chrysocoma graminifolia,* Linn. Sp. 841. The species is there published as new, and the name is accompanied by that which, for that particular author, is an uncommonly full and quite satisfactory description. It is a northern plant; "Habitat in Canada, *Kalm,*" and, as I understand it, does not occur southward beyond New Jersey, and there only along the seaboard.

E. graminifolia, Nutt. Gen. ii. 162, as to the name only. *Chrysocoma graminifolia,* Linn. Sp. 841. Stem 2 feet high or more, striate, glabrous: leaves about 3 inches long, linear, acu-

[1] Mem. Torr. Club, v. 321.

minate, only the midvein obvious, glabrous on both faces, rather obscurely punctate, the margins minutely scabrous-serrulate, the midvein beneath with some few scattered very short hairs like those of the margin: branchlets of the inflorescence glabrous except as showing faint scaberulous angles: bracts of the involucre obtusish, thickened and green toward the summit, strictly erect.

As above intimated, this northern plant, to which Nuttall applied the name, is not at all what he described under the name, in his *Genera*.

E. Nuttallii. *E. graminifolia*, Nutt. l. c. as to the description, not *Chrysocoma graminifolia* Linn. (but possibly *Solidago lanceolata*, Linn.) Commonly 3 or 4 feet high, the very leafy stem both striate-angled and minutely rough-pubescent: leaves of a peculiar somewhat coppery deep green, 3 inches long or more, spreading on the stem, lanceolate, acute, the lowest usually 5-nerved, the middle ones 3-nerved, all nearly glabrous above, obscurely punctate, sparsely strigose beneath except as to the veins, these hispidulous, the margins merely scabrous: short subcorymbose inflorescence very wide, often a foot across, its branches and branchlets strongly hispid-hirtellous; involucres more narrowly turbinate than in the last, their tips more thickened and greener, strictly erect.

This is the common, and the only *Euthamia* of at least the upper Potomac Valley, in Virginia and Maryland, extending to southern New Jersey and Pennsylvania; doubtless also further northward and southward. I dedicate the species to the author who first described it. That it can be the same as *Solidago lanceolata*, Linn. seems altogether improbable; for that, according to his brief account of it, has a subsquarrose involucre, and leaves that are more roughened on the margin than otherwheres, while in our plant the only pronounced roughness is along the veins beneath. Though I doubt altogether that Linnæus' *C. graminifolia* and *S. lanceolata* are, as most authors have assumed, the same thing, yet I am unable to make out, to my own satisfaction, what his *S. lanceolata* really is.

E. FLORIBUNDA. Two feet high or more; herbage dark-green; stem almost glabrous except toward the summit: leaves about 2 inches long, linear-lanceolate, acute, 1-nerved, minutely somewhat strigose-pubescent on both faces, the midvein beneath most pronouncedly so: inflorescence a large very dense fastigiate corymb of uncommonly small heads, the branches of it hispidulous, remarkably leafy-bracted, these bracts as well as the stem leaves either exactly spreading or else notably deflexed: the small involucres turbinate, their bracts strongly imbricate, their triangular green tips very conspicuous; involucre as a whole very glutinous but manifestly also puberulent.

Of this singularly distinct *Euthamia* only one specimen is known to me, and that is in the U. S. Herbarium. It is said to have obtained from the marshes of Delaware Bay at Port Norris, in Southern New Jersey, in 1890, by J. H. Holmes.

E. CAMPORUM. With the habit of *E. Nuttallii:* nearly, half as tall, seldom 2 feet high, the herbage of a brighter light-green and leaves firm, almost coriaceous, narrowly lance-linear, 1-nerved, or the lateral nerves faint, marginally serrulate-scabrous, so also the midvein above, but the lower face of the leaf wholly glabrous, strongly and closely punctate on both faces: inflorescence somewhat fastigiate, the rameal leaves linear, erect; branchlets and pedicels with remotely scabrous angles: heads not densely glomerate; bracts of involucre thinnish, yellow throughout, obtuse.

Very distinct species of the Rocky Mountain plains; the stem whitish, striate but wholly glabrous. The best specimens before me were collected by myself along the Platte River at Sterling, Colorado, late in September, 1896. It occurs eastward in Kansas, and apparently even to North Dakota and Minnesota.

E. MEDIA. Two or three feet high, slender, almost glabrous in all parts, fastigiately corymbose above the middle; stem striate-angled, green, glabrous, leaves 2½ inches long, narrowly linear, acuminate, 1-nerved, rather remotely scaberulous on the

margin, otherwise glabrous, rather firm, obscurely punctate: heads 3 to 7 at the ends of rather long and slender perfectly glabrous pedicels, the whole inflorescence more lax than in related species described above: bracts of involucre much less imbricated, the outer short, green-tipped, the inner abruptly much elongated, without green tips.

Species of the middle Mississippi Valley from Illinois and Missouri southward, in rather sandy soil. An excellent type is in my herbarium from the banks of the Mississippi at Oquawka, Ill., by H. N. Patterson, Sept. 1876. With its slender habit, narrow foliage, and little imbricated involucre, the species in rather strong contrast to the eastern *E. Nuttallii* and the still more westerly *E. camporum*, to both of which it is strictly allied.

E. PULVERULENTA. Apparently 2 to 4 feet high, rather freely branched from the middle with long and strict, or shorter and fastigiate branches, all very rigid, striate, glabrous: leaves 2 or 3 inches long, subcoriaceous, linear, acute at both ends, closely impressed-punctate, 1-nerved, glabrous, the margins showing, under a lens, remote callosities, these rarely amounting to scabrous points: heads rather large, numerous and crowded but mostly pedicellate; bracts of the turbinate involucre very firm and rigid, much imbricated, all with triangular and acute, or more rounded tips, these externally granular-puberulent, or rather pulverulent, this indument universal on the back of the short exterior ones and on the pedicels: rays rather many but short; disk-flowers more numerous.

With its thick almost coriaceous leaves, and its somewhat farinose involucres and pedicels, this species is as indubitable as its habitat is restricted. It is known only from the vicinity of Hockley, southeastern Texas, where it was collected in 1890 by Mr. F. W. Thurow. The type specimens are in the U. S. Herbarium.

E. GYMNOSPERMOIDES. Allied to *E. leptocephala*, but stouter, firmer, freely branched from near the base. 2 feet high, herbage

light-green: leaves narrowly linear, acuminate, rather strongly punctate, 1-nerved, glabrous on both faces, scarcely even the margins scabrous: heads as long as in *E. leptocephala* but narrower; bracts of the involucre firmer more obtuse and more glutinous: rays 10 to 12, long and narrow; disk-flowers 4 to 6

Sapulpa, Indian Territory, 6 Oct., 1894, B. F. Bush. Type in the herbarium of the writer. Very different from *E. leptocephala*, and in aspect strongly recalling the Mexican genus *Gymnosperma*. Among the *Euthamia* sheets of the U. S. Herbarium, I find the following to be referred to *E. gymnospermoides*: one from the "Cherokee Nation" by Blankinship, 15 Aug., 1895: another collected very long ago, by Bigelow, this from the "Antelope Hills of the Canadian." It was listed in Whipple's Report as *Solidago tenuifolia.*

E. CHRYSOTHAMNOIDES. Near *E. gymnospermoides* but the branching more fastigiate and inflorescence more corymbose; leaves as narrow and as firm, similarly impressed-punctate, more strongly and carinately 1-nerved beneath, the margin definitely scabrous-serrulate; heads more elongated and more distinctly turbinate, their firm bracts more obtusely green-tipped, glabrous, except that the inner are ciliate with a few long bristly hairs.

Species well enough marked, though known in but a single sheet of specimens preserved in the U. S. Herbarium. They are mere flowering branches, and were collected near Prescott, Arkansas, 25 Aug., 1882, by G. W. Letterman.

E. CAROLINIANA, Greene, Mem. Torr. Club, v. 321. *Erigeron Carolinianus*, Linn. Sp. 863. In so far as it is connected with a low plant with a corymbose mode of branching that is common both at the North and the South, the above name is misapplied. A critical enquiry into the originals of *Erigeron Carolinanus*, Linn. reveals conclusively the fact that it is a plant exceedingly unlike the *Solidago tenuifolia* of Pursh, with which all authors for eighty years past have blindly agreed in confusing it.

Doubtless all that Linnæus knew about the plant in question he learned from the figure and description that had been published in 1732 by Dillenius. He describes it, evidently from the plate of Dillenius, as an *Erigeron* with panicled stem, solitary heads at the ends of the branchlets, and with leaves narrowly linear and entire. And it is so exactly a paniculate "Erigeron" that he places it next to *E. Canadensis.* Consulting the Dillenian page whereon appears the earliest descriptive account of the plant, it is found to be credited with having a stem two feet high and more, this stem very stout—even of the thickness of a man's little finger, where said stem emerges from the soil.

Now such a plant, large in its dimensions, truly paniculate, though often broadly so—and much more broadly than in the cultivated specimen which Dillenius figured from—with heads either solitary or in threes (as Dillenius said) at the ends of the branchlets, and always pedicellate, is in the herbaria from our southern seaboard, and must needs be accepted as the real *Euthamia Caroliniana;* though by far the greater proportion of our herbarium material so-named represents species very different, and for the most part undescribed hitherto. I would cite as a most satisfactory herbarium representative of *E. Caroliniana* Professor Tracy's number 4748 of my set of his plants. The specimen is fully 3 feet high, and, like other seaboard species, is divested of all its array of cauline leaves at time of flowering. Those present on the branches of the panicle are extremely narrow, rather thin in texture, dark-green, punctate, and exhibit a sparse somewhat hispidulous pubescence. The plant is also quite glutinous.

E. TENUIFOLIA. *Solidago tenuifolia,* Pursh. Fl. ii. 540, in part only. About a foot high, the stem green, striate, glabrous, simple up to near the summit, then subcorymbose: leaves linear or narrowly lance-linear, 1½ to 2 inches long, acute, obsoletely 3-nerved, glabrous except as to the minutely serrulate-scabrous margins, minutely and closely punctate, spreading or somewhat deflected, the whole herbage often blackening in drying: slender

pedicels of the more or less glomerate heads scaberulous; involucres broad, rather campanulate than turbinate, their well imbricated bracts slightly green-tipped, all very obtuse, distinctly 1-nerved.

This is a plant of the sandy soils near the seaboard, or even the sandy seashore, which I trace in the herbaria from Maine to Maryland, though in no great number of specimens. It is from this alone that Pursh must have drawn his character of obsoletely 3-nerved leaves; the other plants of his *S. tenuifolia*, from the south, having much narrower leaves, showing never a trace of lateral nerves.

E. REMOTA. Much like the last in aspect, but larger, sometimes 2 feet high, the narrowly linear leaves of decidedly firmer texture and not blackening when dry, ascending rather than spreading, never deflected: stem fastigiately branched above the middle, the outer branches about as long as the others but commonly sterile, the others only rather sparsely floriferous, the heads not glomerate: involucres broadly turbinate, not notably imbricated, only the short outer bracts green-tipped: rays uncommonly conspicuous for the genus.

Plant of the rolling prairie country about Lake Michigan, not rare from northern Indiana to southern Wisconsin, where it has always passed for *Solidago tennifolia*, Pursh, though abundantly distinct from all the eastern and southern members of that aggregate.

E. MINOR. *Solidago lanceolata*, var. *minor*, Michx. Fl. ii. 116. *S. tenuifolia*, Pursh, l. c. in part. Often 2 feet high, slender, corymbosely parted at about the middle into very slender more or less fastigiate branches all copiously both leafy-bracted and floriferous: leaves 2 or 3 inches long, ascending, very narrowly linear, pungently acute, 1-nerved, strongly punctate, glabrous throughout, scarcely even the margin scaberulous: heads very numerous but not crowded, each one short-pedicellate; bracts of the involucre green-tipped and acutish: rays many and rather conspicuous, light-yellow.

Common in sandy lands from toward the sea to some distance inland, from Connecticut to Florida. Most beautiful specimens have been distributedfrom the Biltmore Herbarium, under the name *Solidago tenuifolia*; and the plant, being doubtless Michaux's var. *minor*, was included by Pursh in his species; though this, and that which I have left to bear the Purshian name, are not at all intimately related.

E. MICROCEPHALA. Dimensions of *E. minor*, or rather smaller: cauline leaves nearly 3 inches long, narrowly linear, acute, punctate and glutinous, the margins, and often the midvein beneath, beset with short stiff serrately disposed hairs: heads very small, of only half the size of those of *E. minor*, and the involucres more glutinous.

Plant of the interior districts of Georgia and the Carolinas; well differentiated from the low country *E. minor* by its serrulate scabrous leaf margins and midvein and its minute involucres. I have seen specimens only in the U. S. Herbarium, the best one being from a dry field near Leslie, Sumpter Co., Georgia, 6 Sept. 1900, by Roland Harper. There is also an immature one from Aiken, S. Carolina, by Ravenel in 1869; and this, though with the same habit and small heads, is distinctly more roughly-pubescent than Mr. Harper's mature one, which, by the way, may well be designated as the type.

E. MICROPHYLLA. Also related to *E. minor*, but taller and stouter, 2 feet high more or less, much more compact in habit, the stem glabrous and, at flowering time, wholly divested of the primary foliage; only the branches and branchlets of the dense fastigiate corymb leafy, these sharply angled, the angles hispidulous, and all clothed with small linear spreading or recurved leaves an inch long or less, dark-green, punctate and sparsely scabro-hispidulous: heads much narrower than in *E. minor* and elongated, their few bracts slightly green-tipped, very glutinous: rays 5 to 8, long and rather conspicuous.

This rather elegant *Euthamia*, remarkable for the densely

leafy-bracted and compact inflorescence of narrow heads, I have only from Ocean Springs, Mississippi, as collected by Professor Tracy, 9 Oct. 1898; unless I may refer to the species some material from Apalachicola, Florida, collected by the late Dr. Chapman, and distributed from Biltmore.

E. SCABRA. Stoutish, rigid, much branched, erect, 4 or 5 feet high, the lower and unbranched part of the stem glabrous, terete, only faintly striate; the rather loose somewhat fastigiate panicle a foot high and almost as broad; the branches and also their linear-lanceolate 1-nerved leaves scabrous, their margins and the nerve beneath scabro-hispidulous; ultimate branchlets sharply angled, the angles hispid, the reduced leaves linear, very obtuse, sparsely hispidulous rather than scabrous: involucres solitary, pedicellate, oblong; bracts firm, the outer ovate, inner linear, all obtusish: rays apparently 4 or 5; disk flowers fewer: achenes canescently strigulose.

A remarkable species, apparently collected only by Prof. Tracy, at Biloxi, Miss., 10 Oct., 1897. It is n. 1750 of my set of his plants, but, as there is no specimen of it in the U. S. Herbarium I infer that duplicates may not have been distributed.

New Species of Monardella.

Before proceeding with the diagnoses of a considerable number of these fine labiates appearing as if hitherto undescribed, it is needful I should correct one error. While most of the material in the herbaria representing suffrutescent species of *Monardella* has been named *M. odoratissima*, I was less careful, on a former occasion, than I should have been, in attempting to ascertain just what plant Bentham had in view under that name. It is now evident, to me, after careful investigation, that my *M. nervosa*, Pitt. iv., 322, is quite exactly *M. odoratissima*, Benth.;

and the plant has very rarely been collected. All the bulk of our material so named in the herbaria must now be otherwise disposed of. Much of it will fall into species here to be proposed.

M. LEDIFOLIA. Strongly suffrutescent, the woody stem and its sterile densely leafy branches 8 to 12 inches high, the loosely leafy and peduncuIiform flowering branches about as long: leaves small for the plant, seldom ½ inch long inclusive of the very distinct petiole, the blade oblong-lanceolate or ovate-lanceolate, obtusish, entire, somewhat revolute, canescent above and silvery beneath with a fine appressed pubescence, both faces also conspicuously punctate with large dots: heads large, commonly 1 inch and more in diameter, usually subglobose, the flowers then quite concealing the bracts, these mostly little differentiated from ordinary leaves and deflexed: calyx setulose-hairy and resinous-dotted, its short teeth hispidulous: corollas lavender-color.

Common in the hill country of Napa, Sonoma and perhaps Lake counties, California, and by me formerly mistaken for *M. Sheltonii* (Man. p. 288). It is copiously represented in my own herbarium, but there is no trace of it among the many and varied *Monardella* sheets of the U. S. Herb.

M. SUBSERRATA. Allied to *M. villosa*, about as large, more slender, the whole plant pale and glaucescent as well as pubescent, and leaves much less firm in texture, these an inch long including a rather long and slender petiole, ovate, obtusish, rather remotely and irregularly serrate, conspicuously white-veiny beneath, not at all so above, both faces rather shortly rough-pubescent: bracts of the involucre altogether inconspicuous, small and scarcely differentiated from the ordinary leaves, nevertheless erect, embracing the flower-cluster: calyx-tube green and almost glabrous, as also the teeth externally, but the latter villous-hairy within: corolla apparently only pale purple or lilac, the short tube somewhat hairy.

Sonoma Co., California, Geo. W. Dunn, June, 1890.

M. GLOBOSA. Allied to *M. villosa*, not villous, perennial but hardly suffrutescent, the stout decumbent stems a foot high: leaves very large, 1 to 1½ inches long, ovate, obtusish, short petiolate, remotely and obscurely crenate-serrate, notably veiny, minutely and rather obscurely punctate, green and, to the unaided eye, glabrous above, a lens disclosing short and scattered bristly hairs, the veins beneath loosely hirsutulous: bracts of the very large subglobose heads wholly leaf-like and deflexed, only somewhat narrower and more obtuse than the proper leaves: calyx-tube hirtellous, the short obtuse teeth scarcely hispidulous: corollas rose-purple.

A remarkable and perhaps somewhat local Californian species, known to me in a single specimen, but this an excellent one, from Leona, Alameda Co., collected by my former pupils, Messrs. Michener and Bioletti, in August, 1892; distributed by them, if at all, under the name of *M. villosa*, of which it might be suspected to be an overgrown and abnormal state, were not the habit, and the pubescence totally different.

M. NEGLECTA. Suffrutescent, low and slender, ordinarily not 6 inches high, the herbage green or reddish, glabrous or very nearly so: leaves lance-ovate, obtuse, entire or very obscurely serrate-toothed, about ½ inch long, indistinctly venulose, petiolate and ascending or suberect: heads nearly an inch broad; bracts from ovate to oval and oblong-elliptic, purple at apex, glabrous except as to the rather strongly ciliate margin: calyx-tube with only here and there a slender hair, but the short teeth hirsutulous; corolla apparently pale-purple, the tube not exserted.

Though inhabiting Marin Co., the part of California which, as having been the favorite field of exploration with Californian and visiting botanists for fifty years, this neat and elegant as well as most distinct little *Monardella* does not appear to have been collected except by G. R. Vasey in 1875, and Geo. W. Dunn in 1890. The special locality is, of course, unknown.

M. OVATA. Only feebly suffrutescent, low, the slender decumbent stems 6 or 8 inches high and with rather few pairs of large

thinnish ovate leaves, acute at apex, at base from abruptly tapering to subcordate, entire or obscurely few-toothed, both faces sparsely punctate with large glands, and obscurely puberulent: head an inch broad; bracts from obovate to ovate-lanceolate, acute, thin and somewhat fenestrate, the subscarious portions between the veins purplish, all superficially strigose and marginally strongly retrorse-ciliate: calyx-tube hirsutulous, but under the triangular acute teeth strongly hispid.

Of this, peculiar among the perennial species, by its somewhat fenestrate bracts and acute calyx-teeth, the only specimens seen are in the U. S. Herb., from near Sisson, California, June, 1897, by H. E. Brown (n. 381).

M. INGRATA. Suffrutescent, the slender tufted stems a foot high and, with the foliage, pale with a fine but not very dense puberulence: leaves small, few exceeding ½ inch, ovate-lanceolate, obtuse, entire, conspicuously veiny only beneath, both faces sparsely dotted with large impressed glands: heads small, about ¾ inch high but less in breadth; bracts unequal, the outer and round-oval ones half the length of the inner, all closely parallel-veined, pubescent and strongly ciliate: calyx-tube pubescent apparently only along the striæ, the very short almost deltoid teeth densely hirsutulous: corolla-tube retrorsely pubescent; color of flowers unknown.

Known only from some uncertain station in southeastern Oregon, where it was collected a number of years since by Mrs. Austin, who remarks that it is readily distinguished from what was called *M. odoratissima* by its very disagreeable, even mephitic odor.

M. OBLONGA. Low perennial, hardly suffrutescent, the stems tufted on the crown of a perpendicular root and about 5 to 7 inches high: herbage pale with a fine close puberulence, the bracts pale-rose: leaves about ¾ inch long, subsessile and ascending, mostly exactly oblong, some of the lowest broader and more nearly elliptical, all entire, nearly veinless, moderately

punctate: bracts of involucre oval or elliptical, pubescent, scarcely ciliate: calyx-tube sparsely bristly-hairy and with more copious short hairs beneath; teeth subulate, densely short-setulose: corrolla rose-purple, its short tube retrorsely hispidulous.

Known only as collected by myself in the mountains south of Tehachapi, California, 24 June, 1889.

M. RUBELLA. Perennial, but less suffrutescent than the last, the stems arising simply from the ends of horizontal ligneous but subterranean rootstocks, and about a foot high, slender, with long internodes, red-purple, as are also the bracts of the involucre: herbage otherwise pale with a minute almost imperceptible puberulence: leaves $\frac{3}{4}$ inch long, oblong-lanceolate, petiolate, entire, almost veinless, spreading, mostly with short densely leafy sterile branches in their axils: bracts oval, abruptly acute, thin, of a rich red between the parallel nerves and retrorsely puberulent, but the minute hairiness of the nerves appressed the other way, the margin definitely ciliate: calyx-tube equally and finely pubescent, but the teeth strongly setose-hispid: corolla pale-purple, its short tube pubescent.

Known only as sent me many years since, from near Verdi, Nevada, by Mr. C. F. Sonne. Its nearest ally is *M. Modocensis.*

M. MURICULATA. Suffrutescent, low, barely 6 or 8 inches high, the tufted stems slender, finely puberulent and also sparsely beset with a minute but stoutish murication: leaves almost glabrous, strongly pellucid-glandular, ovate-lanceolate, veinless, entire, less than $\frac{1}{2}$ inch long: heads small and few-flowered, the few involucral bracts very unequal, all except the two outer and more leaf-like ones thinnish and subscarious, very obtuse, obovate-oblong, strongly ciliate, superficially pubescent and with the same scattered muriculation of red-purple points which adorns the stems and is also extended to the tube of the calyx; teeth of the latter triangular, acutish, sparsely hispid: corollas short, rose-purple.

Known only from specimens obtained by the writer in 1895, near the summit of the West Humboldt Mountains, Nevada. It differs from all other species in being ornamented with scattered dark-red protuberances, which, though short and pointed, can not be called hairs.

M. EPILOBIOIDES. Only weakly suffrutescent, low, only about 6 inches high, pale as if very glaucous, but clothed with a minute retrorse pubescence: lowest leaves crowded, from suborbicular and round-obovate to obovate, very obtuse, hardly ¼ inch long, the others thrice as long and remote, obovate-oblong and linear-oblong, acutish, veinless: bracts of the small involucres mostly elliptical, acute, reddish, pubescent, scarcely ciliate, less than ½ inch long: calyx hirtellous throughout, the triangular-subulate teeth scarcely more so than the tube.

In Bear Valley, at the eastern base of the San Bernardino Mountains, Calif., S. B. Parish, June, 1894; the specimen in the U. S. Herb., and indicated as a variety of *M. linoides;* but differing too widely in habit, size, and most essentially in being truly pubescent, the almost impeerceptible puberulence of *M. linoides* being a thing totally different.

M. VIMINEA. Evidently tall, the long somewhat willowy branches in the herbaria 2 feet long, with internodes of 2 or 3 inches, but basal and presumably woody part of stem not known; herbage not very pale, somewhat glandularly puberulent, especially toward the inflorescence; the few leaves lance-linear, 1 to 1½ inches long: verticillasters large, commonly two, one above the other, but bracts comparatively small, ovate to elliptical, not colored, pubescent and copiously resinous-glandular, the longest not longer than the calyxes, shortly and rather indistinctly ciliate; calyx pubescent along the nerves and resin-dotted, the teeth short, pubescent, purplish.

This species, quite in contrast with all others by its lax willowy habit and often double infloresence, is from some unrecorded locality in the mountains of San Diego Co., California, first col-

lected by G. G. R. Vasey in 1880, at least as to the most typical specimens. But Mr. Parish has more recently distributed what is essentially the same from "McCoon's Ranch, near Poway, San Diego Co., 1897." A third sheet, and one which I refer to here with some hesitancy, is from "20 miles north of Palma Spring, Riverside Co., on Taurus Mountain, 1897," by H. M. Hall. All these are in the U. S. Herb.

M. ANEMONOIDES. Perhaps as tall as the last, not as slender, with quite the puberulence of *M. linoides* and not glandular, the foliage larger, thinner: head solitary, not large, greatly surpassed, and even somewhat globosely enveloped by large greenish-white petaloid bracts, these about 6 or 7, broadly elliptical, obviously glandular-puberulent superficially, scarcely ciliate: calyx densely and shortly appressed pubescent, its teeth with also a few longer somewhat spreading hairs.

A plant of most remarkable aspect among labiates, the solitary heads, apparently long-peduncled, with petaloid bracts, recalling some upright one-flowered *Clematis* or *Anemone*. The only specimens seen are in the U. S. Herb., from the Greenhorn Mountains, Kern Co., Calif., by Edw. Palmer, 1888.

M. EXILIS. *M. candicans*, var. *exilis*, Gray, Syn. Fl. 358. Annual like *M. candicans*, smaller and more slender; bracts much narrower in proportion, abruptly acuminate; calyx-teeth longer, more rigid, acute, white, the tube at summit purple in maturity.

First collected by Dr. Palmer, in Kern Co., Calif., on the north fork of Kern River, in 1888. More recently by C. H. Purpus, at Walker Pass, 1897. While allied to *M. candicaus*, the specific characters are abundant.

M. SANGUINEA. Allied to *M. lanceolata*, nearly as large, but more slender, much more freely and divaricately branching, leaves and heads only half as large, the former mostly elliptic-lanceolate, only those of the lower main stem truly lanceolate:

bracts of the involucre narrowly ovate, acute, scabrous-pubescent: calyx-teeth triangular-subulate, merely villous-pubescent, without spreading or hispid hairs even at the base: corollas large and long-exserted for the size of the head, of a dark purple-red.

Apparently common in some parts of the counties of San Diego and San Bernardino, southern California, and thoroughly distinct from the comparatively large, obtuse-leaved *M. lanceolata* which has twice or thrice larger heads, with broad bracts and pink-purple corollas. My best specimens are from near Julian, where they were collected by G. W. Dunn, in 1881 and 1888. Mr. Parish has distributed what appears to be the same, from the San Bernardino Mountains.

M. PENINSULARIS. Near the last, about as tall, still more slender, the branches ascending rather than divaricate, and the heads smaller, stem and branches canescently pubescent; leaves narrowly lanceolate, obtusish, with nothing of the elliptic in outline; bracts of the small heads ovate, acutish, not scabrous, only strigose-hairy along the veins: calyx similarly strigose between the striæ, the teeth narrower and more obtuse than in the last: more coarsely and conspicuously pubescent: corollas short, pale rose-red.

Known only from some uncertain station in the northern part of the peninsula of Lower California, where it was collected by Mr. Orcutt, 6 June, 1885.

New or Noteworthy Violets.

V. ACHLYDOPHYLLA. Related to *V. scabriuscula* and similarly clothed with a minute sparse roughish indument, though to the unaided eye appearing glabrous; herbage of a peculiarly dark green, and the leaves few and ample, paler beneath, the very long-stalked radical ones subcordate-reniform, 3 or 4 inches broad, the length either much less or about the same, the few cauline ones much smaller, deltoid-subcordate, all coarsely and somewhat sinuately, or almost repandly crenate, flowers not seen: capsules glabrous, the triangular-lanceolate sepals glabrous, erect, even appressed to the capsule.

Type collected by myself in a piece of low moist woodland near Austin, Minnesota, 27 June, 1898. Species easily distinct from all other known violets of the group, by the dark-green of its herbage, the peculiar sinuate indentation of the leaf margins, and thirdly, by the attitude of its sepals, these in all forms of *V. pubescens* and *scabriuscula* radiating away from the base of the capsule in the form of a star. This striking character of those two species may or may not have been adverted to before; but I recall no mention of it.

V. OPHIOPHILA. Akin to *Nuttallii*, much larger every way except as to the flowers, these comparatively small: stems weak at base, 5 to 8 inches high, at flowering time exceeded, even in maturity equalled by the extremely long-petioled lower leaves: herbage in age wholly glabrous but notably puncticulate, when young very minutely pulverulent or puberulent, this obscure indument appearing on the angles of petioles and peduncles in the form of scattered very short deflexed hairs: largest mature leaves 1½ inches long and about as broad, subcordate-deltoid, tapering very gradually to the long petiole, obviously cucullate, sinuate-dentate: corollas not seen, all the flowers in the flowering specimens apetalous, succeeded by a small subglobose pulverulent ovary and capsule, this very few-seeded; capsules from earlier and presumably petaliferous flowers elongated-oval.

Steep hillsides at Snake River Landing, eastern Oregon, 30 May, 1901, W. C. Cusick; erroneously named "*V. atriplicifolia*, Greene."

V. EUCYCLA. *V. cyclophylla*, Greene, Pitt. iv. 7 (1899), not of Gandoger, Fl. Lyon. 53 (1875). This correction is not one involving any question of the tenability of specific names issued in the *Flora Europae* of the same author. In the *Flore Lyonnaise* all the new species proposed are diagnosed as fully as in the average local floras of botanical authors as they go; and that such names as *Viola cyclophylla* should be omitted from the *Kew Index* must be attributed either to inexcusable oversight or personal prejudice.

V. Brainerdii. Akin to *V. blanda* and *V. renifolia*, larger than either, commonly 4 inches high or more, leaves mostly exactly orbicular with deep and narrow basal sinus, the apex occasionally quite truncate, in maturity 1½ to 2½ inches broad, the petioles 2 or 3 inches long, the whole glabrous except for some scattered hirsutish hairs along the veins beneath, sometimes extending to the upper part of the petioles: petaliferous flowers as in *V. renifolia* except that the petals are not glabrous, the laterals usually bearing a small loose tuft of hairs: capsules from late apetalous flowers short, darkly mottled and on much shorter stouter peduncles.

This though by no means an easily differentiated segregate of *V. renifolia*, seems to be a necessary one. Its general aspect is exceedingly different, the large foliage, glabrous and of a vivid almost shining green above, seems to be a firmer texture decidedly than that of either *V. blanda* or *V. renifolia*, which latter is almost hoary-pubescent on both faces, the leaves of which have petiole much longer in proportion than those of *V. Brainerdii*, and capsules not only green without dots, but longer, more acute, and borne more uprightly, instead of horizontally or reclininglv. The proposed new species has not the low swamp habitat of *V. renifolia*, but grows, like *V. Leconteana*, in damp rich woodland, on mountain sides, etc. One of its striking peculiarities, not inviting mention in the diagnosis, is that at time of late apetalous flowering the species has the habit of producing, as its last leaf of the season a solitary rather long-petioled one, the blade of which in so far departs from the normal orbicular as to be almost exactly and rather acutely cordate—precisely the leaf of *V. Leconteana*—and to the influence of this one *Leconteana* leaf must be attributed the fact that the species is often found labelled *V. amœna*, Le Conte. While it is next of kin to *V. renifolia*, it is not commonly found in the herbaria under that name. And, certainly a far more common plant in northern New England and Canada than that kindred species, its upland habitat must have helped to separate it, in the minds of northern botanists, from *V. renifolia*.

The recognition of this species or subspecies as such, has been forced upon me by a most perfect series of specimens communicated this year, by President Brainerd of Middlebury College, Vermont; these being accompanied by copious material of both *V. blanda* and *V. renifolia* from the same district. Earlier specimens of *V. Brainerdii* in my herbarium are the Canad. Survey Herb. n. 18,903, collected by Mr. J. M. Macoun at Beaver Meadows near Ottawa, 1898, no specific name given by Mr. Macoun on the label, this fact indicating his inability, after studying it, to call the plant by any specific name. Again his n. 21,685 from Cache Lake, Algonquin Park, Ontario, unidentified by him, is *V. Brainerdii* with an unusual number of leaves imitative of those of *V. Leconteana.* His n. 21,648 from the same station, showing one *Leconteana* leaf, while the others are normal, he labelled *V. amœna.*, (i. e., *Leconteana*). Even Mr. Pollard's n. 17 of our distribution of N. Am. Violacæ, obtained in Ontario by Mr. Umbach, and distributed for *V. renifolia* is, at least as to the sheet I have, *V. Brainerdii*, though one of the three specimens has not a little of the hairiness of *V. renifolia* on the upper leaf-face. The most northeasterly representation of the species, with me, is from Prince Edward Island, and was communicated by my esteemed and valued correspondent, Mr. L. W. Watson.

V. VARIABILIS. Rootstocks short, stout, in at least the older plants branching and the scapes and leaves in so far tufted, though only loosely; the habit rather slender, herbage of rather soft-membranaceous texture and more or less pubescent throughout, only the youngest leaves quite glabrous superficially but their petioles hairy; peduncles commonly not quite equalling the leaves, the whole plant 4 to 7 inches high: leaves of great variability on different plants (essentially alike on the same plant), in some wholly uncut, merely crenate and of subreniform-deltoid outline, 2½ inches broad and 2 in length, cucullate; in other plants all of subhastate-deltoid figure and deeply cleft into oblong subfalcate segments; in others quite imitating those

of *V. sagittata* in outline, but the body of the leaf above the sagittate and incised base coarsely few-toothed: sepals lance-oblong, obtuse, strongly ciliate even to the short and rounded auricles: corollas more than an inch broad in the larger plants, not deep violet, petals broad, subequal, the laterals densely hirsute at about the base of the blade: apetalous flowers almost or quite hypogeous.

The specimens of which the above is a description were gathered by myself, in an open and rather dry piece of gently sloping woodland about half way up Maryland Heights, near Harper's Ferry, 14 May, 1898. There was no other violet growing with it, or even in the near vicinity of it; and the about three conditions of it, as to cut of leaf, are all so dissimilar that, were such a character of any worth, three species might have been recognized here, instead of one. Yet, from a diligent study of the plants as they grew, supplemented by a critical examination and comparison of the carefully prepared specimens in the dry, I am of the opinion that such should not be named even as varieties. The plants are precisely one thing, in all but the fact that some specimens have uncut strongly cucullate leaves, others broad deeply palmatifid ones, still others an exactly sagittate leaf-outline. The one thing of which I am confident is, that this mountain woodland plant is perfectly distinct from a related woodland violet common enough in lowland Maryland and Virginia, and with which I am very familiar. That my *V. variabilis* has not one or more names already, I dare not say. But I hold that it is far better, in case like this, where I have one species under forms enough to make three, to give it a new name, for purposes of observation and discussion, than to apply to it by guess merely, any old name which might or might not belong to it.

The palmatifid phase of *V. variabilis* is exceedingly similar to Mr. Pollard's recently proposed *V. Angellæ*, indeed so much like it that I have little if any doubt they are one, specifically. But then again, the uncut and cucullate-leaved form is quite as like the type specimens of my own *V. populifolia.* I can not

easily separate these. Now from the northern region whence comes the original of *V. populifolia* I have never heard of the discovery of a palmatifid or even incised-leaved state of it; nor has any violet of such cut been communicated from Ontario. Neither does Mr. Pollard report any uncut-leaved state of his *V. Angellæ;* and, among the difficulties of the situation are questions like this which intrude themselves: may not a violet as variable as this in foliage appear in one locality under one form of leaf only; in another under another one only of its several leaf-phases?

I must here mention a somewhat similarly variable violet—possibly the same species—forms of which I have from Mr. Homer D. House of northern New York. The specimens were collected near Syracuse, in May of this year. Those with leaves uncut are broader than those of mine, decidedly deltoid in outline and seemingly not cucullate. This, Mr. House has somewhere learned to call *V. palmata asarifolia;* though the original of *V. asarifolia* is to be a plant common in the low country of Virginia and southward, one which I confidently identify and familiarly know, as a thing most unlike the New York plant. Then Mr. House names his variously incised or palmatifid form simply *V. palmata,* Linn., a name the exact application of which is altogether too grave a question to entertain at present.

I make mention of this particular case of good field work done by Mr. House partly because he is convinced of the specific unity of the various forms, and partly because I think it possible that the plant from New York and mine from the Maryland mountains may, after further research and fuller comparison, come to be rationally regarded as one.

V. NEPETÆFOLIA. Acaulescent, the stoutish rootstocks multicipitous, the leaves and flowers therefore in considerable tufts, the whole 5 to 7 inches high at full petaliferous flowering; herbage glabrous, or the veins of some leaves showing a row of short ascending hairs arising from the midvein and some of its branches: leaves of thin texture and small, mostly cordate-

deltoid and 1½ inches long, but the smaller earliest from reniform to orbicular, all as coarsely crenate as those of a *Glechoma* or *Nepeta,* their petioles very long and slender: the still more slender peduncles remarkably short, of little, if any more than half the length of the leaves, bractlets inserted much above the middle: sepals oblong-lanceolate, minutely though distinctly ciliolate; petals violet (perhaps pale), with obovate obtuse limb, the upper pair distinctly largest, laterals only slightly bearded, the keel conspicuously shortest.

For this most distinct and doubtless new violet I am indebted to the zeal and acumen of Mr. E. S. Steele of the Smithsonian Institute, who collected it in a piece of low woodland two miles beyond St. Elizabeth's hospital, on or near the border of the District of Columbia, 27 April, 1899; who noted some of its peculiarities, at the time, but admitted, with me, that it might be called *N. affinis,* Le Conte; a position from which now, upon a careful examination and comparison, I am obliged to recede. The apetalous flowers are all above ground on short very slender, ascending peduncles.

Some specimens constituting n. 20 of Mr. Pollard's distribution, under the name of *V. cucullata,* collected by Mr. W. R. Maxon somewhere near Washington in the year 1900, I would refer here with little or no hesitancy, although none of these, as far as my set shows, have that very marked outline of a catnip leaf (though more cordate) which those obtained by Mr. Steele so perfectly exhibit.

V. LATIUSCULA. Acaulescent, related to *V. affinis,* but herbage of firmer and more succulent texture, equally glabrous in all its parts: early and petaliferous plants only 3 or 4 inches high: leaves from semiorbicular and subreniform to more elongated and subhastate-cordate, ¾ to 1 inch in breadth, the earliest shorter, the later somewhat longer than broad: peduncles few, about equalling the leaves, bibracteolate near the middle, bractlets narrow, acuminate, few-toothed: sepals ovate-lanceolate and lanceolate, obtuse, short for the size of the corolla: corolla of broad

rounded outline and very open, an inch broad, the length obviously less, all the petals broad and obtuse, the two uppermost largest, the keel as long as any, broadly spatulate, the laterals densely bearded with clavellate hairs, the color of the whole rather deep violet (fading to almost white in the dry): apetalous summer plant 4 to 10 inches high, the variously deltoid-subreniform leaf-blades 1½ to 3½ inches broad, the length much less, margin lightly subserrate-crenate: apetalous flowers on short horizontal hypogeous peduncles gradually thickened upwards: capsules of such elongated and mottled.

This very satisfactory new violet is from Twin Mountains, West Rutland, Vermont, and was collected May 24 and July 15 of 1902, by Mr. W. W. Eggleston, who writes that it grows in open shady well drained soil. Its affinities seem to lie with what I have been calling *V. affinis*, Le Conte, from which, however, it differs not less in the firmer texture of its herbage than in the remarkable breadth of both its leaves and flowers.

V. PERAMŒNA. Rootstocks short, not stout, multicipitous, giving rise to large and close tufts of leaves and flowers, the whole plant commonly 10 inches high, the petioles and peduncles of about equal length, rather slender; herbage dark-green and nearly or quite glabrous, the corolla of a rich violet: leaves all cordate-reniform, about as broad as long, none large (for a plant so tall), ¾ to 1½ inches wide and long, very regularly but rather lightly fine-crenate, the earlier plane, those developed simultaneously with the flowers strongly cucullate, these developing short scattered appressed stiff hairs above: peduncles with a pair of small subulate very green-herbaceous bractlets in about the middle: sepals all short and obtuse, glabrous, the two lowest oblong-ovate, subfalcate, the others narrower and straight: petals subequal, all but the odd one with broad rounded limb, and this of spatulate outline.

Species known only as collected by myself, on the moist grassy banks of a ditch, a mile or so to the eastward of the village of Marengo, southern Michigan, 22 May, 1902. Its affinities are

doubtless with *V. cucullata*, from which it is readily distinguished by the deep-green of its herbage, the slender character of its petioles and peduncles, the short broad very obtuse sepals, and both the great breadth and deep coloration of its petals. By the large size, rich color and great profusion of flowers all fully exposed beyond or amid the foliage, this is most showy wild violet I have ever seen.

While I mention it as being related to *V. cucullata*, I must not have it to be inferred that this is one of the bog-meadow violets. Its habitat is rather that of uncommonly moist and rather low prairie land far enough from being swampy or boggy.

Out of a very extensive collection of violets made by my esteemed correspondent, Mr. John Macoun, in southwestern Ontario in 1890, duplicates of which were sent me a year ago, I select a number of sheets that belong undoubtedly to this proposed new species. This is of course closely adjacent to that part of Michigan whence the type specimens are derived. His numbers 33,878 and 33,880, both Niagara, Ont., I confidently refer here; also less confidently his 33,893 from Sandwich (just across the Detroit River from southeastern Michigan), and 33,876 from Amherstburgh (of which Mr. Macoun himself remarks: "This seems to be new"), for the sepals of these last are quite too narrow for typical *V. peramœna*. Still others of his herbarium numbers from the Ontario collection I place with this only provisionally and with a feeling of uncertainty. One of these (n. 33,874, from Windsor, 5 June) is interesting as being in fruit only, and exhibiting capsules up among the leaves, all from flowers that were petaliferous; capsules, too, very different indeed from those of any near ally of *V. cucullata*.

V. CRASSULA. Rootstocks short, stout, branching; the tufted leaves and flowers 4 or 5 inches high, their stalks stoutish, rather succulent, as also the smallish leaves, the plant wholly glabrous as to the younger growth, but petioles of later leaves quite strongly villous-hirsute, the hairs slightly deflected, herbage of a light-green, but leaves mostly reticulate-veiny and purplish

underneath, round-reniform to cordate, lightly and often obscurely crenate, obtuse, ¾ to 1¼ inches in diameter, all but the earliest distinctly cucullate: peduncles minutely and subulately bibracteolate above the middle, sepals lanceolate, or the two broad ones lance-oblong, rather short, auricles very prominent, margins partly naked and partly bristly-ciliate: corollas of middle size, scarcely ¾ inch broad, deep-blue rather than violet, upper petals largest, all very broad and rounded, the laterals bearded with very short hairs strongly clavate from a slender base.

Type collected by myself in an open and sunny but very wet meadow of sedges, near Jackson, Michigan, 17 May, 1902.

This is genuinely a bog-meadow violet, and more truly allied to *V. cucullata* than some others. On proceeding down a hillside to the low meadow where I found it, I first encountered, on the highest border of the wet land, a diminutive blue violet which, although I had not before seen it growing, I immediately suspected would prove to be my *V. crenulata;* and passing to lower land more distinctly boggy, I left that behind. *V. crassula* had its own area, with no congeneric associate. Its size, fleshiness and stoutness, as also the leaf-outline suggested *V. vagula*, which also I had never seen growing; but it proves, to my regret, wholly irreconcilable with that, and I am compelled to recognize it as another proper species of the same group.

Six years ago I had the good fortune, after a single season's study of certain acaulescent violets of the East, to be able to indicate, among other facts relating to the group, the strong and plain distinctions between the common upland plant with uncut cucullate foliage, and the analogous one inhabiting bog-meadows exclusively.[1] While I felt a doubt, and openly expressed it, as to the correctness of every application of the names *V. obliqua*, Hill, and *V. cucullata*, Ait., as to the perfect distinctness of the species, there was no room in my mind for doubt;

[1] Pitt. iii. 142, 143.

and, of the two writers who soon after wrote disparagingly of my propositions, intimating that there were others who, knew much more about these plants than what I had supposed myself to have learned in one season, the one has in the interval conceded again and again, in print, my whole position, while the other has maintained silence on the topic ever since. In a word; the kind of characters then and there first indicated as essential have been recognized as such, by all recent students of the genus, without exception, and the species reinstated have since obtained well nigh universal recognition.

Meanwhile, I myself, after eight years of careful research in field, herbarium and library, have come to the conclusion that the bog-meadow violet, my *V. cucullata* (whatever Aiton's plant of that name may have been) is an aggregate of several clearly distinguishable species. There are bogs and swamps of various descriptions, in the different parts of the country; bogs green and grassy or sedgy; bogs of small shrubbery with moss and lichen covering the ground; bogs of sphagnum; bogs open to the full glare of the sun all day; bogs deeply shaded by luxuriant forest growth: and there are smooth cucullate-leaved pale-flowered acaulescent violets in all; and they are different. I have waited long, in order to make sure they were different; and being convinced, I shall endeavor to give the characters of at least two or three segregates of what, in 1896, I called "*V. cucullata*, Ait.?", leaving still under that name the type mainly studied, collected and distributed by me, from a small swamp of grass and sedge, near Ellicott City, Maryland, 3 and 24 May, 1896.

V. MACROTIS. Rootstocks stoutish, multicipitous, the leaves and flowers therefore in rather large tufts as in *V. cucullata*, but taller, nearly a foot high at petaliferous flowering, the herbage thin and scarcely succulent, leaves less cucullate; herbage glabrous to the unaided eye, but petioles commonly with many scattered spreading or deflexed hispid-looking hairs seen under a lens, sometimes truly glabrous, blade of leaf larger than in

V. cucullata, mostly exceeding 2 inches wide, cuspidately acute, short bristly appressed shining hairs along the veinlets and between them on the upper face, such more notably forming a minute ciliation of the margin, the lower face glabrous, also distinctly paler: peduncles very slender, quite glabrous, not quite equalling the leaves: sepals narrowly lanceolate, delicately but interruptedly ciliolate, the basal auricles remarkably long, entire or more or less deeply cleft, sharply pointed, often hispidulous; corolla not large, about ¾ inch broad, none of the petals villous or hirsute, but the laterals with a small cluster of papillæ rather than hairs, apetalous flowers aerial but on rather short upright peduncles.

Type specimens collected by myself, near Surrattsville, Maryland, 17 May, 1896, in a woodland swamp, in deep shade. Number 4 of the North American Violaceæ, collected by Mr. Pollard in a "Moist wooded meadow, Berlin, Camden County, New Jersey, 4 June, 1899," has the characters of this species, and must be referred to it, I think, though my specimen has no petaliferous flower, and the petioles are glabrous, the leaves almost so; but the sepals and their auricles, no less than the large, almost plane leaves, indicate *V. macrotis*. The sepals in *V. cucullata* are broader, perfectly glabrous marginally as elsewhere, and have very short blunt or truncate wholly inconspicuous auricles.

V. LEPTOSEPALA. Near *V. cucullata*, smaller, about 4 or 5 inches high at petaliferous flowering and the flowers borne quite above the foliage; earliest leaves wholly glabrous, some of the later with a few hairs on the petiole and some short appressed ones along the border of the blade, all the leaves round-cordate, obtuse, very lightly and almost obscurely crenate-serrate, ¾ to 1½ inches long, the lower and middle ones as broad as long or even broader: bractlets of the peduncles very small, not opposite, apparently always separated by an interval of 2 to 4 lines: sepals extremely long and narrow, those of the largest flowers ½ inch long and of nearly ¾ the length of the petals, glabrous,

very prominently and acutely auricled: corolla pale-violet, less than an inch broad, the spatulate obtuse petals equal and all similar, the laterals with a small but dense tuft of hairs: apetalous flowers aerial but their peduncles short and ascending.

This elegant violet, so easily distinguished from all other allies of *V. cucullata* by its extraordinary calyx, I know only as collected by myself at Oakland, Maryland, 26 May, 1902. Its habitat was a wet but exposed and sunny bank traversed by streamlets from springs. The real *V. cucullata* grew as plentifully in the same soil, and the marked difference in size and general aspect between the two led me to make specimens of both for examination. Inasmuch as Oakland has an altitude of about 2,400 feet, I have suspected this of having a wider range at low levels in the north or northeast; but no specimens matching it, or even approaching it, are found in the collections of violets from New York, New England or Canada.

V. PRIONOSEPALA. Long and slender upright or ascending rootstocks, seldom with a branch or two, usually simple, the leaves and flowers few, the latter apt to considerably exceed the former, and the plant from 3 or 4 inches to 7 or 8 in height; herbage of a rather lighter green than in *V. cucullata*, thinner and less succulent, almost or altogether glabrous, mere hints, as it were, of sharp hair-points being visible under a lens along the upper-face nerves in some leaves, the blades in large specimens much larger than in *V. cucullata*, not cucullate, of much more elongated and acute cordate outline, the sinus often narrow; sepals long and narrow, with somewhat prominent and acute auricles, the margins often interruptedly serrulate-ciliolate: corollas in well grown plants an inch broad, light blue-violet, the rather narrow obovate-spatulate keel obviously shorter than the others, the laterals bearded: apetalous flowers strictly aerial but on rather short recurved peduncles.

This appears to have about the widest range of any of the bog violets, occurring from perhaps northern Pennsylvania through New England and eastern Canada. In my herbarium it is the

most abundant of all plants that have, since 1896, been called *V. cucullata*, though sometimes it has come in labelled *V. affinis.* What has of late induced me to make a critical study of the plant has been a most beautiful and complete series of specimens from western Vermont, sent by Mr. Ezra Brainerd in large part, and others just as fine, in less copiousness, by Mr. Willard Eggleston. Mr. Brainerd assigned no specific name to his specimens, but informed me, early last summer, that he thought it undescribed. Earlier examples of it are found among my sheets of so-called *V. cucullata* communicated by Mr. James M. Macoun, such as the Canad. Surv. n. 18,972 from Chelsea, Quebec, 1898; and there is another from the same station, approximately at least, communicated by Dr. Fletcher under n. 8. I infer this species to be an inhabitant of sphagnous swamps, for the long slender often perpendicular rootstocks, as also the roots, are so clean and white as to give the suggestion that they were never in contact with any soil, but grew in the midst of sphagnum beds.

V. CONSORS. Allied to the last, usually less than half as large, often only 2 inches, rarely 5 or 6 in height; leaves and flowers few, the former of a very light-green, smaller, more inclined to be obtuse and cucullate: sepals very narrow, lance-linear, scarious-margined, the scarious border occasionally and here and there cut into serrate teeth, more commonly quite entire: corolla light-bluish (sometimes even pale-blue), from ½ to 1 inch long, the petals narrow, oblong-spatulate, subequal, the laterals bearded: late apetalous flowers on shorter upright or merely ascending peduncles.

This violet, in its larger forms, verging towards both *V. prionosepala* and *V. Watsonii*, I have long striven to refer to one or the other of those two, but vainly. It has its own marks. It comes from Prince Edward Island, communicated by Mr. L. W. Watson, of Charlottetown. It grows in mossy (not sphagneus) bog lands in the open and with the species last named, and commonly elsewhere apart from that.

V. WATSONII, Greene, Pitt. iv, 5. Through repeated sendings of this fine white-flowered violet from the original station by Mr. Watson—and the species is not otherwise at all known—I was long since convinced that it is in no wise to be regarded as an ally of such plants as *V. blanda*. It is simply a fine white-flowered relative of *V. cucullata*, distinguished readily from all others, not only by the clear white but the extremely narrow and elongated pattern of its petals. Not even the specimens of its nearest ally, *V. consors*, which have the largest and palest of blue flowers, exhibit the narrow petals of *V. Watsonii*.

The succeeding species bear no intimate relation to *V. cucullata*; and the first three are types of a northern, chiefly Canadian, group of marked peculiarities.

V. SUBVISCOSA, Greene, Pitt. iv. 293. I must here confess a grave error in the diagnosis of this species. On page 294 of the volume cited, much that relates to calyx and corolla is false, and should be replaced by the following: lowest sepals obliquely lanceolate, the others oblong-linear, all obtuse, closely and evenly ciliate with spreading hairs, the auricles of the three upper ones prominent: petals spatulate-obovate (the upper pair) and spatulate (the other three), the laterals rather sparsely hairy: leaves at apetalous flowering stage little larger than the earlier, their petioles little more elongated: peduncles of apetalous flowers mostly buried, fleshy-thickened and blanched above the middle; sepals only delicately ciliolate, nearly or quite equalling the oblong or void capsules.

As to the above new diagnosis of flowers in this species, I may say that it is necessitated by the fact of my having confused two species in my original description of *V. subviscosa*, taking the vegetative characters of one, and the floral characters of another. For some most beautiful specimens of the real *V. subviscosa*, such as gave me knowledge of it in its æstival stage, I am indebted again to President Brainerd, who obtains the plant "under

young pines in a mountain pasture" at Middlebury, Vermont; also "on the west slope of Chapman Hill" in the same region, the peduncles of the apetalous flowers in these last specimens horizontal, but scarcely hypogeous or fleshy-thickened.

I shall next subjoin the segregate of my first and confused *V. subviscosa.*

V. NESIOTICA. With the habit and even the foliage of *V. subviscosa,* but more pubescent, not subviscous: peduncles also hirsute on one side or angle: calyx short, the 2 lower sepals oval or almost ovate, the others somewhat narrower, all very obtuse their auricles broad and short (not in the least prominent, on the contrary obscure), the whole margin hirsute-ciliate: corolla an inch broad or more, all the petals with broad rounded limb, the lowest one a little shorter, scarcely narrower than the others, the laterals and also the lowest pubescent with more or less scattered hairs: leaves in late summer state twice as long as in the early, on short slender rather rigid and very erect petioles 4 to 6 inches long: apetalous flowers and their fruit on short almost filiform hispidulous horizonal petioles (perhaps under moss or dead leaves, rather than hypogeous) their sepals very small, strongly ciliate, the auricles prominent, hispid, the calyx as a whole of hardly half the length of the thick round-obovate or subglobose mottled capsule.

I have this only from Prince Edward Island, whence it is sent by Mr. L. W. Watson. At petaliferous flowering it is known by its exceedingly broad and obtuse sepals and broad petals. In the later stages there is a habital difference, as above indicated, between the two, as well as a difference in the characters of the peduncles and flowers.

Although in the original account of *V. subviscosa* Mr. Watson's P. E. I. specimens are first mentioned, the name *subviscosa* is derived from Dr. Fletcher's plants from Quebec; this correspondent remarking, in a letter, that the plants in process of drying seem to be somewhat glutinous. It is partly, then,

owing to this fitness of the name as applying to the Quebec plant, that I retain that as the type of *V. subviscosa.*

V. MELISSÆFOLIA. Rootstock stoutish, branching, knotted, but white, the roots very fine-fibrous and white: loosely clustered leaves and flowers 5 to 10 inches high; herbage rather pale, very thin and delicate, but peduncles and petioles, though soft and weak, not slender, very sparsely and obscurely hirtellous-hairy; leaf-blades small for a plant so tall, the largest not 2 inches long, many not more than 1 inch, round-cordate to cordate-ovate, the youngest cucullate, all very regularly though rather coarsely crenate all around, even into the basal sinus and to the insertion on the petiole, both faces, but especially the upper, finely appressed pubescent, though sparsely so, the whole margin ciliolate: flowers large, nearly an inch in diameter, sky-blue; 2 lower sepals lanceolate, the others oblong-lanceolate, all obtusish, ciliolate; petals with broad rounded limb, the keel shorter, laterals with a tuft of villous hairs, all with deep-purple veins.

Dry ground, in shade of Hemlock Spruce, Prince Edward Island, L. W. Watson, 1902. Allied to *V. nesiotica*, but very different; in habit recalling *V. prionosepala* in a way, yet in no wise related to that group.

V. DICKSONII, Greene, Pitt. iv. 65. Since the publication of this violet as new, Mr. Dickson has collected and forwarded to me two consignments of carefully made specimens, one of which exhibits the plant in its æstival stage, fruiting from apetalous flowers; and in this condition the species is most singular among known violets. In the largest of the specimens there are about three fruits, two of which are capsular, at the ends of short peduncles that are not only horizontal but blanched, thus evincing the fact of their having developed in the complete shade of at least new leaf-mold at the surface of the soil; while the third fruit is not only completely hypogeous, but converted into what

appears to be a berry. It is evidently globose (as large as an ordinary wild gooseberry, or middle-sized pea), absolutely indehiscent, the pressed and dried pericarp being unbroken, translucent and showing the seeds that lie within, just as, in the herbarium, the seeds of many a berry-like fruit are seen through their fleshy covering in its dried state.

In habit, this summer state of *V. Dicksonii* is much like that of *V. communis* (*V. papilionacea*, we now call it), the leaves being commonly two or three only, and the flowers and fruits not more numerous. The largest of Mr. Dickson's examples in this stage is more than fourteen inches high, its largest leaf over four inches broad and about as long. All show a broad shallow sinus, and vary from round-reniform and obtuse to subcordate-reniform and acutish. None appear to have been cucullate.

This species is now known to range from southwestern Ontario to Quebec on the Canadian side; and it seems to be a plant of open woodlands and thickets. Mr. Dickson himself says "moist banks in thin woods, near Hamilton." About Ottawa, according to Mr. J. M. Macoun (n. 18,770), it is found on "grassy banks and open woods near streams, Rideau River;" and again, for petaliferous specimens of the same herbarium number: "Thickets on the bank of the Rideau River." The plant is to be expected as perhaps common in northern New York, but there is no sure proof yet of its being there, though I see ground for suspicion that Mr. House obtained it, this year, near Syracuse, if so, confusing it with *V. nodosa*. In Western Vermont Mr. Brainerd finds it "in open woods at base of mountains, Middlebury" n. 51, petaliferous, also under n, 51, growing "under bushes near Boardman sugar-orchard, near Middlebury," and again, in "rich soil on a shaded limestone cliff, Orwell," n. 101, these last two late, showing more or less hypogeous fruits, but none baccate. Small specimens of late summer stage, in fruit, but none baccate, are sent from Royalton, Vermont, by Mr. W. W. Eggleston.

V. NODOSA, Greene, Pitt. iv. 296. Often called upon, as I

have been within the last year, to name specimens of the acaulescent violets of northern New York and New England and adjacent Canada, I at first found it not easy to distinguish, in the dry, between *V. nodosa* and *V. Dicksonii*, both being so near each other and to the more westerly *V. cuspidata;* and even when reverting to my original diagnosis, I have more than once felt that only an expert phytographer could be expected to make out what distinctions I had found between the two; even further, I have mentally been on the verge of blaming myself for having published *V. nodosa.* Yet do I always come forth from these reiterated examinations confident as at the first of the validity of both species.

At full petaliferous flowering the obvious marks of *V. nodosa* are its smaller more hairy strongly cucullate foliage, and the weakness of its numerous peduncles owing to which these curve downwards as the petals wither; all of which points are manifest in specimens taken and dried at this stage. Later, when the petaliferous flowering is past, and the summer foliage is developed, this foliage (no longer cucullate) presents a strikingly deltoid outline, very different indeed from the rounded and cordate figure of that of *V. Dicksonii.* Two sheets from Mr. House, one of late May, 1902, the other of early June, 1901, both from Syracuse, N. Y., illustrate this perfectly. Of the late fruiting of these species, as to the original station at least, I know nothing, the specimens I have not showing anything more than a few partly hypogeous apetalous flowers.

As to the range of *V. nodosa*, my own discovery extends it to northern Ohio and southwestern Michigan. In the middle of last May, near Toledo, out on a search for some possible easterly station for my *V. cuspidata*, in a low woodland where the soil was heavy and somewhat clayey, I found a violet which I could not place. I did not like its associations for any violet I had ever seen growing; for its neighbors were *Ranunculus septentrionalis, Flœrkea proserpinacoides* and other things affecting cold wet woodland shades. But my dried specimens were afterwards

found to match exactly, in every particular, the originals of *V. nodosa.* A few days later, in a situation somewhat similar, not far from the village of Marengo, Michigan, I saw it again, but inadvertently took no specimens. As to New England, there is a sheet in my herbarium from Charlotte, Vermont, collected, by Pringle, May, 1876, which I hold to be indubitable *V. nodosa*, in petaliferous flower only. I also refer here Mr. Brainerd's n. 71 from "Rich woods, along a small brook, northwest corner of Middlebury, Vermont," 20 May in petaliferous state, 29 June in apetalous condition; but in the latter scarce one of the leaves has the deltoid figure at all pronounced; and, if in the earlier ones the leaves are not, in the dry, so manifestly cucullate as they ought to be for genuine *V. nodosa*, I can make allowance in view of Mr. Brainerd's well known carefulness to prepare the neatest and most beautiful of specimens. But for purposes of study, where the question is one of leaves plane or leaves cucullate, a specimen placed in press less carefully is like to be more useful.

There are some plants from Quebec, by Mr. Macoun, that I think may belong here though I decline to mention numbers, lest the reference of these to *V. nodosa* might some day be proven erroneous.

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PITTONIA.

A Series of Botanical Papers

BY

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Washington, D. C.

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NEW OR NOTEWORTHY SPECIES.—XXX.

TRIFOLIUM ANODON. Annual, near *T. stenophyllum*, like it in habit, more slender, the heads and flowers only half as large: leaflets ½ inch long, narrowly linear, acute, entire: filiform peduncles exceeding the leaves: heads ¼ inch broad in flower, the small petals white at summit, dark-purple in the middle; involucre parted into 5 or 6 oval obtuse or emarginate lobes half the length of the flowers; calyx-teeth unequal, triangular-subulate: corollas not widely inflated.

Collected at San Diego, Calif., by T. S. Brandegee in April, 1902 and 1903; distributed by C. F. Baker under nn. 828 and 3422.

TRIFOLIUM BRACHYODON. Size of the last, rather more slender and flaccid; leaflets similar in size and outline, but the lowest truncate and cuspidate, the others acute and setaceous-pointed, the margins of all with short subserrate teeth: peduncles filiform, exceeding the leaves: heads ¼ inch long in flower, the small corrollas rose-purple; involucre parted into 5 or 6 oblong obtuse or acutish lobes: calyx-teeth linear-subulate, longer than the tube and of more firm and herbaceous texture: corollas moderately inflated.

On dry summits of Santa Catalina Island, Calif., March, 1901, Mrs. Trask.

TRIFOLIUM DECODON. Size of the foregoing and nearly allied, the slender branches firmer, purplish: leaflets all broad and short, few exceeding ¼ inch long, many much shorter, obcordate to cuneate-obvate and oblong cuneiform, emarginate to retuse, truncate or nearly obtuse in the uppermost, all with about 5 minute but salient teeth in each margin; slender wiry peduncles more than twice the length of the leaves: heads ¼ inch broad at flowering, the corollas dark-purple; divisions of involucre 7 or 8, oblong or oval: calyx-teeth short, subulate-setaceous; corollas widely inflated in age.

Collected by Brandegee at San Diego, Calif., 20 May, 1903, and distributed by C. F. Baker under n. 3371. Species remarkable among members of this section of *Trifolium* for its broad and short leaflets.

The type specimens of all these new clovers are in my own herbarium.

CHAMÆCRISTA CAMPORUM. Annual, stout, erect, simple or with two or three suberect branches, commonly 2 or 3 feet high, very leafy and floriferous, nearly glabrous: leaves large; leaflets 9 to 13 pairs, oblong, ½ to ¾ inch long, obtuse, sharply mucronate, not notably venulose, glabrous except as to the very minutely and rather obscurely scabrous-serrulate margin: flowers fascicled and numerous; buds of oblong-lanceolate outline, short-acuminate, the sepals strongly pilose up and down the midvein, otherwise glabrous: corollas more than an inch broad, golden-yellow: growing ovaries densely but rather coarsely villous; pods about 2½ inches long, straight, with a short curved beak, the margins pilose-pubescent.

Abundant in certain localities, in rich prairie soil, from central Illinois northwestward to southern Minnesota; the type specimens collected by myself at Monticello, Illinois, 7 August, 1899.

Amelanchier subintegra. Loosely but rigidly branched, 5 to 8 feet high: leaves oval to suborbicular, commonly an inch long at maturity and nearly as broad, obtuse or truncate, serrate-toothed across the broad summit only, otherwise quite entire, of subcoriaceous texture, almost full-grown at flowering time, pale and obscurely tomentulose beneath, scarcely so above: racemes short, few-flowered, erect, the rachis, petioles and base of the broad-campanulate calyx villous-hairy; calyx-teeth short, deltoid and acuminate, not reflexed, villous within and marginally: petals oblong-cuneiform, obtuse, retuse, or emarginate, about 4 lines long: fruit not seen.

Wooded hills of Lake and Napa counties, California; collected by myself at the northern base of Mt. St. Helena, Aug. 1888, in mature foliage; Howell Mountain grade, by Mr. Jepson, May, 1893, in flower only; also by Mr. C. F. Baker, near Lakeport, 12 May, 1903, in flower only, and distributed by him under n. 2964.

Rosa yainacensis. Apparently low and depressed, the branches only 6 or 8 inches long, unarmed except by pairs of stout and prominent nearly straight infrastipular prickles: stipules terminating rather acutely, their margins closely beset with subsessile glands; rachis of the leaves with a few slender prickles and more numerous short-stalked glands: leaflets in about 3 pairs, rather closely approximate, oval to obovate, nearly sessile, doubly serrate, glabrous and deep-green above, pale and puberulent beneath; peduncles of the mostly solitary flowers densely glandular-hispid under the calyx, but the tube of this perfectly smooth and glabrous, subglobose; the oblong foliaceous-tipped lobes with some scattered prickles about the basal portion: corollas small: fruit not seen.

Hills of the Yainax Indian Reservation, southeastern Oregon, 1893, Mrs. R. M. Austin; types in my own herbarium.

Rosa aldersonii. Apparently a low bush, the slender stem and branches glabrous and very glaucous, destitute of prickles except as to a pair of very stout and conspicuous, nearly straight but slightly deflected ones beneath each stipule: leaflets 7, ovate or oval, obtuse or truncate, simply or doubly serrate-toothed, ½ to ¾ inch long, dull-green and glabrous above, paler and villous beneath; stipules also villous and with few scattered marginal glands; the rachis of the leaf sparingly prickly: calyx-tube smooth and glabrous, the segments pubescent, villous-margined: corollas small.

Collected on Witch Creek, San Diego Co., California, in June 1894, by R. D. Alderson; type specimens in my own herbarium.

Chrysothamnus laricinus. Allied to *C. stenophyllus*, more decidedly shrubby and quite diffusely branching, the stem and branches with a glabrous but very white bark: leaves very short and almost acerose, ½ inch long or more, acute, glabrous except as to the scabrous-ciliolate margins: heads rather few and subcorymbose at the ends of all the branchlets; bracts of the involucre subcoriaceous, in about 3 ranks, subcarinate, all with very acute or acuminate somewhat spreading tips: corollas deeply cleft and the segments recurved: style-tips subulate, pubescent: pappus bristles very rigid.

Known only as collected on or near the Moqui Indian Reservation in northeastern Arizona, August or September, 1899, by Walter Hough; the type in the U. S. Herbarium.

ANTENNARIA MESOCHORA. Pistillate plant a foot high, its fruiting corymb large, loose: stolons short, their mature leaves $2\frac{1}{2}$ to $3\frac{1}{2}$ inches long including the long merely herbaceous-margined petiole and rather shorter limb, this obovate, little longer than broad, obviously mucronate, lightly flocculent above the first season, the second glabrate, beneath densely but scarcely permanently silvery-tomentose: involucre singularly green and free from wool, only obscurely arachnoid, the white tips small and narrow, or commonly almost obsolete: achenes long and slender, globular-papillose. Stems of staminate plant comparatively low and slender, seldom a half-foot high, the corymb often proliferous (compound); tips of involucral bracts conspicuous, obovate, variously somewhat crenate or erose: tips of pappus-bristles well flattened, crenate rather than dentate or serrate.

This is the common large-leaved Antennaria of the lower Lake Region, north of the Prairie Region, or on its borders. As it has been coming in to me for several years past, from collectors, though always in too young a state, and in the pistillate condition only, I have referred it to *A. occidentalis.* But in May, 1902, being in southern Michigan at just the right time, and finding without difficulty staminate plants, I was able to see that this is not referable to any published species. The male plant is most unlike that of *A. occidentalis* in being more slender, and in having a much more ample, often proliferous inflorescence; and the male pappus-bristles in the species last named are both narrow and serrulate, not broad and crenate. *A. occidentalis* belongs exclusively to a different and a southerly region. In central Illinois, whence I have my type specimens, it has probably its northern limit.

The common eastern species, of which *A. mesochora* is the

inland homologue, is *A. fallax;* and the two, as to the female plant, are so alike in aspect that I should never be able to distinguish them at a glance. But as to the involucres they are distinct enough; the scales in *A. fallax* being less than half their length herbaceous, and this part covered and obscured by wool, while in *A. mesochora* there in no such wool on the scales, and these herbaceous almost to the summit. But the male plants of *A. fallax* are again very strikingly unlike those of *A. mesochora*, being tall and stout, with not only broad but well elongated scale-tips which are evenly erose; and the male-bristle-tips in *A. fallax* are broad and sharply and deeply serrated.

It becomes more and more certain, from these studies, that we can never know our antennarias well but by critical field study on the part of the most experienced investigators, and in the light of knowledge of the staminate plants, which, though often rare, are most important.

Dodecatheon laetiflorum. Stout stem firmly erect, ½ to 1½ feet high from amid a tuft of small leaves, the roots short and rather fleshy, the newly formed and uppermost even almost fusiform: leaves very small for the plant, obovate to nearly elliptical, about 1½ inches long including the short petiole, the margins entire and minutely crisped, or plane and with a few evident small teeth, the whole plant pale-green, glabrous except as to the bracts, pedicels, and calyx, these sparingly glandular-puberulent: corollas large, the segments white, except at base, these for a short space deep-yellow, the short tube below colored into a ring of deep violet-purple: stamens slightly monadelphous; anthers short, oblong, obtuse, exactly erect, not in the least connivent, the style well exceeding them.

An exceedingly beautiful large white-flowered species,

common in groves of oak at Gilroy, Cal., 13 April, 1903, collected by Carl F. Baker and distributed by him under n. 1945. Its nearest affinity is the small *D. patulum.*

DODECATHEON SANCTARUM. Stout, firmly erect, 7 to 12 inches high: roots short and fleshy, the newly formed uppermost almost fusiform: leaves obovate to nearly elliptic, 2 or 3 inches long, including the rather long scarious-margined petiole, all obtuse, narrowly scarious-margined, either minutely crisped or else plane and lightly as well as remotely crenate with a small callous tooth in each notch, the whole plant glabrous except the pedicels, calyx, etc., these more or less glandular; calyx-segments oblong, obtuse, glandular-ciliolate: corolla large, its segments an inch long, rich purple except at the base, there whitish or flesh-color, the short tube of the darkest purple; anthers short, oblong, obtuse, nearly erect, somewhat divergent rather than convergent, the dark-colored connective strongly crested below, somewhat so almost to the summit; style exserted; capsule circumscissile near the summit.

Santa Lucia Mountains, California. R. A. Plaskett, Feb., 1898; distributed for *D. Clevelandi,* but not related to that; much more like *D. Hendersonii.*

VERONICA OXYLOBULA. Allied to *V. Americana*, about as large, of like habit and glabrous: lowest leaves oval and ½ inch long to ovate-lanceolate and 1½ inches, obviously petiolate, entire, the floral not much larger, more lanceolate, lightly and almost obscurely serrate, acutish, all short petiolate: racemes in all the axils: sepals elliptical, just equalling the capsules, these not in the least notched or emarginate but rather acutish: persistent style about as long as the capsule, not slender, erect.

Type specimens from Golden City, Colorado, collected by myself in 1871, and then mistaken for *V. Americana* from which its entire or subentire foliage and the longer and almost acute capsules require that it should be distinguished.

VERONICA CRENATIFOLIA. Smaller than the above, more slender and diffuse, freely creeping, 4 to 8 inches high, glabrous, not glauceous, but the herbage of a singularly light green: leaves ½ to 1½ inches long, all petiolate, the lowest suborbicular or round-oval, the upper and larger nearly all elliptical, all but the very uppermost crenate rather than serrate, but some of the lowest and smallest entire: racemes and petioles very slender, the flowers rather few: sepals somewhat oblanceolate.

The type of this is Baker, Earle and Tracy's n. 33, from along the Mancos River in southern Colorado, 22 June, 1898, distributed for *V. Americana.*

TISSA LUTEOLA. Annual, with a dense system of rigid, stoutish, yellow-green, glabrous, short-jointed branches, each plant forming a mat 5 to 10 inches broad, yet not prostrate, erect-spreading rather; leaves short, linear, subterete, pungently acute, glabrous, yellowish; stipules deltoid, acuminate: bracts and pedicels of the dense inflorescence glandular-villous, as also the broad green midrib of the otherwise scarious sepals: petals exceeding the calyx, apparently white: seeds minute, reddish-brown, broadly semiobcordate, none winged, but all minutely roughened by subsessile glands, especially around the thick obtuse margin.

Pacific Grove, Monterey, California, 28 May, 1903. A. A. Heller.

The Genus Viola in Minnesota.—I.

Among the species of *Viola* proposed as new in the last issue of Pittonia were several that were known to me only from within the limits of the extensive and physiographically diversified State of Minnesota. Not long after the publication of these, there came to me, from the University of Minnesota, evidence that certain students there had been endeavoring to work up their collectings of last season, in the light of my papers upon the genus; for a considerable suite of specimens was sent me, asking for my approval or disapproval—as the several cases might demand—of their identifications of the species.

Having acceded to this request, I was afterwards besought by Professor MacMillan to permit him to send me for inspection and study the entire collection of Minnesota specimens of this genus as preserved in the Herbarium of the State University; and this article is the result of such a study of all that has hitherto been collected of these plants, within the State, under the auspices of the institution above named.

The collection is an extensive one; attesting a zeal and a thoroughness on the part of a great number of botanists, botanical collectors and amateurs beyond all that I had anticipated, even with a full knowledge of the contents of that elaborate list of ten years ago, published under the direction of Professor MacMillan, in the *Metaspermæ of the Minnesota Valley*.

The new catalogue of violets here given, is made in the light of all, or nearly all, the original material of the *Metaspermæ* list, augmented by much that has accumulated at the University Herbarium since 1892, and by extensive and

important gatherings of my own in the southern counties in 1898.

While much of the material is good, some is poor, and the determinations in the case of some are not very positive. As a subject for herbarium study the genus is at best difficult. Nevertheless, the following catalogue can not fall short of proving eminently serviceable to all who are engaged in research upon the genus in the Northwest; and further investigation will be likely to call for some additions to the list, and doubtless, ultimately, for a revision of the whole.

1. V. CUSPIDATA, Greene, Pitt. iii. 314. Established by me in 1898 upon material from Wisconsin, I find in the Minnesota Herbarium the oldest specimens I have seen, of this excellent western violet. One sheet, exhibiting but a single specimen and that in petaliferous flower, purports to have been collected at Minneapolis, in 1878, by J. C. Kassube. Sandberg collected it at Vasa in May, 1882, and at Red Wing in 1876, the specimens in both instances very good, though in the early and petaliferous condition only. But the more recent collectors, on the other hand, have taken the plant in its summer stage only. Such are two sheets in my own herbarium, the one from Austin, the other from near Windom, both in June, 1898; while in the Minnesota Herbarium there are some seven such sheets, all gathered last year (1902), in the southern section of the State, mostly by W. H. Wheeler and C. O. Rosendahl. What is now very desirable, is a systematic collecting of this fine species in its petaliferous and apetalous stages, both in each instance from the same locality, and from the selfsame spot. No such work on it has yet been done.

2. V. POPULIFOLIA, Greene, Pitt. iii. 337. Some young and rather imperfect specimens, obtained at Two Harbors on

Lake Superior, in June, 1893, by Mr. Sheldon, seem to belong here; as also two others from Lake Itasca, May, 1902, by Lyon and Rosendahl. Within the last two years the species has been discovered to be rather common in Ontario, and southern Michigan just west of Ontario. It is readily distinguished from *V. cuspidata* by its smaller size, deltoid leaf-outline, and more pronounced hairiness. I do not know of its occurrence within or near the habitat of *V. cuspidata*, and here in Minnesota it is perhaps confined to the north-eastern section, whence come the few specimens seen.

3. V. NODOSA, Greene, Pitt. iv. 296 and v. 104. For our warrant in attributing this to Minnesota we are indebted again to the extensive and excellent field work of Mr. E. P. Sheldon, who obtained it near Brainerd, June, 1892, and somewhere in Ramsey Co., May, 1893. It is, therefore, probably no rarity in the middle-eastern section of the State. For an account of the associations in which it is to be sought, as well as for its obvious external marks, the student should consult the reference last cited.

4. V. PRATINCOLA, Greene, Pitt. iv. 64. This might be called the Low-Prairie Violet, as to its habitat as compared with that of *V. cuspidata*, which itself might be designated as the Woodland-Border Violet. The present species was first recognized by myself as growing abundantly near Windom in 1898. Out of the various species covers in the Minn. Herb. I gather about eight sheets which I confidently refer here, and which indicate it to be common in meadows about Minneapolis, thence southward throughout the State, westward to Pipestone near the western boundary. It is readily known from *V. cuspidata* by its lack of pubescence, and its rather light-blue corollas; and its leaves are smaller in proportion to the size of the plant, and more rounded.

Though its petals are pale, and though the plant inhabits rather low meadows, it is not at all allied to the eastern *V. cucullata* or any of the recently proposed segregates by that species, in which the apetalous flowers are borne erect and above ground.

5. V. SUBROTUNDA, Greene, n. sp. Low large-leaved short-petioled plant about 4 inches high at petaliferous flowering and wholly glabrous, not at all succulent, the foliage ather thin, deep-green, the blades suborbicular, cordate art base, subserrate-crenate, obtuse, about 1½ inches in breadth and 2 in length, the slender petioles of less than twice the length of the blades: petaliferous peduncles quite surpassing the foliage, also slender, bibracteolate not far below the flower and the bractlets not opposite, rather remote: sepals short, obtuse, ovate-lanceolate, nerveless, strongly auricled; petals blue, not large (the corolla little more than ½ inch broad), oblong, obtuse or emarginate, nearly equal in size and length: peduncles of apetalous flowers equally slender, aerial but short, ascending, their capsules short, ovoid.

Although next of kin to *V. pratincola*, this plant is at essential disagreement with that species by its large short-stalked and broadly rounded leaves, and especially by its aerial and upright apetalous flowers and their rounded pods. I infer that it is also a prairie violet. The type sheet is from Holmes, Polk Co., by Prof. MacMillan, Aug. 1900; the date a late one for a violet to be in petaliferous flower, though the locality is rather far north. The only other specimens which I refer here are from the same northwestern section of the State, Fergus Falls; and these were also obtained in Aug. 1900, by C. A. Ballard; but they are out of flower, though exhibiting well a number of mature capsules.

With the exception of the white-flowered *V. Brainerdii*, no other East North American violet—not even *V. rotundi-*

folia—has foliage so nearly approaching the orbicular in outline as this.

6. V. PERAMŒNA, Greene, Pitt. v. 94. There are two sheets from Hennepin Co., one by Sandberg in 1890, the other by some collector whose initials seem to be "O. W. O.," of the date 1886, which I can not but regard as belonging to this species. But the habitat of Sandberg's plant is said to be "copses," and it grows among mosses, these being intertwined among the petioles and peduncles at base; and not such is the habitat of the species where I found it in Michigan, nor as collected in Ontario by Mr. Macoun.

7. V. CUCULLATA, Ait., Greene, Pitt. iii. 143, 336. I find a single sheet which I can somewhat confidently name *V. cucullata*. The specimens were collected in Ramsey Co., May, 1893, by E. P. Sheldon. There is no note of habitat; but the plant need be sought only in very wet grassy or sedgy meadows.

8. V. PRIONOSEPALA, Greene, Pitt. v. 99. It is also by means of the thorough field work of Mr. E. P. Sheldon that we are able to place this comparatively new and distinctively northern species on the list of Minnesota Violets. Two sheets, both from Knife River, in the Lake Superior region, collected by him in 1893, seem to belong here; though I fail to detect on any of the few sepals examined the ciliolation, yet habitally and by leaf and rootstock, the plant is *V. prionosepala*.

9. V. SANDBERGII, Greene, n. sp. Low and rather succulent, with light-green glabrous herbage, the rather copious foliage at petaliferous flowering forming a tuft 3 inches high, the flowers borne somewhat above the leaves, all from an elongated suberect not very stout white rootstock with

white roots: leaf-blade about 1½ inches long by 1 inch broad, of deltoid outline but with rounded and cucullate basal lobes, the margin lightly but evenly crenate; sepals lanceolate and lance-oblong, definitely auriculate, nerveless, obtusish, glabrous throughout: corolla rather more than ½ inch broad, apparently blue, the petals subequal, narrow, two of them sparingly bearded: peduncles of apetalous buds short, ascending or almost horizontal.

This is clearly a new member of the natural group of Wet Meadow Violets, of which *V. cucullata* is the type. The whiteness of the rootstock and roots clearly indicates a boggy and perhaps sphagnous habitat. The sheets of type material are three; one from Red Wing, by Sandberg, in 1886, the label bearing the note "Wet places;" one from Minneapolis, by T. J. McElligott, 5 May, 1891; one from Lake Johanna, by E. P. Sheldon, April 1895. Over and above these, I place under the same species cover a plant from Red Wing, by Sandberg, in 1886, which is like the others except that the leaves are smaller, the flowers larger and on more elongated petioles, and the plant is said to inhabit "Sandy woods." The rootstock in these two specimens is wanting.

The plant can be no rarity in Southern Minnesota, and it is to be hoped that resident students of the genus may take pains to collect the plant again, and in its later stages; and that they may make full notes of its habitat and its associations.

10. V. SUBSAGITTATA, Greene, Pitt. iii. 315. There are a dozen sheets of this in the Minnesota collection, the labels collectively indicating that it is a common violet in the southeasterly portion of the State, with no evidence of its occurrence either in the northeastern lake region, or in that prairie district which embraces all western Minnesota. In

the *Metaspermæ* it was mistaken for V. *sagittata*, and all the original labels bear that name; but some recent student of the violets has divided the sheets between *V. sagittata* and *V. fimbriatula*, though of neither of these is there a specimen present. By the way, the referring of what I have called *subsagittata* to *fimbriatula* is not a new proposition, for in several eastern herbaria I have found this western plant named *V. ovata* rather than *V. sagittata;* which, indeed, is nearer the truth; that is to say, it is more nearly allied to the former than to the latter.

The original description of this excellent geographical subspecies requires amendment. The leaves by no means uniformly exhibit those rounded lobes which almost close the sinus. Occasionally, as in some specimens by Burglehaus, from near Minneapolis, 1892, the leaf-outline is quite that of *V. sagittata*, and even the petioles are as long and the leaves as erect as in that species; and here the hue and texture, together with the pubescence, mark the plant as *V. subsagittata* notwithstanding. The sepals in this species, it should have been said, are acute (though not always ciliate), and the peduncles glabrous. These last two marks are important, as being points at which the plant is in contrast with the following.

11. V. SECEDENS, Greene, n. sp. Intimately related to *V. subsagittata*, widely different in aspect, by short and broad cordate-ovate leaf-blades on slender ascending petioles of thrice their own length; petaliferous peduncles little exceeding the leaves, glabrous above the middle, retrorsely hirsute below: sepals short and obtuse, glabrous, not in the least ciliate: corollas apparently as in the last, but apetalous flowers on short peduncles that are barely ascending, not erect, but in fruit upright, though much shorter than the leaves.

The history of this segregate, as I am concerned with it,

is as follows: In the summer of 1898, not long after having published *V. subsagittata,* I was in the field where I had been familiar with the plant almost forty years before. At various points in southern Wisconsin I found it in abundance; but the month was June, and the plant was in its summer stage, with large foliage, and plenty of pods from apetalous flowers—just the condition in which I wished to see and collect it. And wherever I found it plentiful, there I was always confronted with another form, growing with the type, exceedingly and strikingly unlike it in that its leaves were broad-cordate, without a hint of the sagittate, and its petioles very much elongated, while the peduncles of its fruits were out of all proportion short. This thing was by no means common. While associated immediately and invariably with *V. subsagittata,* there would exist, say a hundred of that plant to one of the divergent cordate-leaved form. I made good specimens of it, and they have remained until now, nameless, within the *V. subsagittata* cover. In the Minnesota collection I am gratified to find flowering specimens of what I have no doubt is the same. There are two sheets of it, both gathered in June, 1892, by Mr. Sheldon, at different stations in the Mille Lacs region.

The plant is doubtless an abrupt derivative of *V. subsagittata,* and possessed of less vitality than its parent species in so far as we can learn, inasmuch as it seems not to propagate itself; otherwise we should find it more copiously, and not in the condition of a solitary individual amid a patch of hundreds of the other. There were not the slightest hints discoverable by me, of any intergradation.

12. V. SELKIRKII, Pursh, in Edinb. Phil. Journ. vi. 324. Not mentioned in the *Metaspermæ,* though collected as early as 1891, by Dr. Sandberg, at Thompson, Carlton Co., but in fruit only, and mistaken for *V. blanda,* and so labeled. The

only other sheet in the collection is from Tower, June, 1893, by E. P. Sheldon, these specimens being in full petaliferous flower. Both stations are in the Lake Superior region, and the species will hardly be found elsewhere in the State.

13. V. PEDATIFIDA, Don. Gen. Syst. i. 320. Some sixteen sheets of this, now in the Herbarium, show the species to be distributed throughout the southern and western or prairie sections of the State; sometimes occurring in sandy soil among the hills, but as often in the open prairie in the richest of prairie soil. It is common from Illinois and Missouri northward into Manitoba.

14. V. BERNARDI, Greene, Pitt. iii. 260; Pollard, in Britt. Man. 635. This not altogether satisfactory species holds its characters well enough in Minnesota. There are six sheets of it in the Herbarium; and such of them as were in hand when the Metaspermæ was written were all referred, not to *V. pedatifida* (or *V. delphinifolia*) to which it is so nearly allied, but to *V. palmata*. All the old labels bear that name, except one in which the species was referred to *V. pedata*. This fact is not insignificant, indicating, as it does so plainly, that the idea of its being a form of *V. pedatifida* is not suggested to the field observer. Its peculiarities as a subspecies near to *V. pedatifida* are, a lower and more robust habit; merely palmatifid somewhat fleshy-herbaceous foliage, on very pronouncedly hairy petioles; broader, more obtuse and more notably ciliate sepals, and broader petals. No specimens, however, of quite such pronounced characters as the originals from Rock Co., Wisconsin, are in the Minnesota collections. It is hoped that future field work in Minnesota may result in a more thorough knowledge of this interesting plant, which I regard as of perhaps recent descent from *V. pedatifida*.

15. V. INDIVISA, Greene, n. sp. In maturity 6 to 10 inches high, very erect both as to leaves and peduncles of apetalous flowers, these in fruit of scarcely one-third the length of the petioles: leaves all undivided and of a peculiar outline between deltoid and transversely rhomboid, the largest 3½ inches broad, the length usually less, some cuneately tapering to the petiole, others almost truncate at base, all deeply toothed or cleft into subfalcate lobes or rounded teeth, the lobes themselves when deep and broad crenate-toothed on one margin, both faces glabrous except as to a few short and obscure hairs along the nerves and margin, the petioles and peduncles both slender and wholly glabrous: sepals in petaliferous flowers lanceolate, 3-nerved, strongly and truncately auricled, glabrous even marginally: capsules from apetalous flowers oblong, their sepals small, with long auricles.

This most remarkable violet, with rank flabelliform and falcate-toothed foliage, first became known to me in the summer of the year 1898, as I was botanizing on the prairies of southwestern Minnesota. Its aspect is so very strange, the pattern of its rank foliage so peculiar, that had it come to me first from some correspondent, and in herbarium specimens, I think I might have been long in guessing rightly its affinities. But, in the field, its habitat was that of *V. pedatifida;* that is to say, it grew in such soil as in which one expects to find that species, in the prairie regions, and not only so; where this plant was abundant, on the outskirts of the field which it occupied I found a few specimens of real *V. pedatifida,* though with scarcely a hint of intergradation between the two. With this knowledge of the plant I labeled my specimens *V. pedatifida,* var. *indivisa* at the time.

It was after having seen these specimens of mine, and heard my statement of the plant's affinities, that Mr. Pollard

gave out in Britton's Manual, concerning *V. pedatifida*, that: "Forms occur, in which the leaves are merely slightly lobed."

The Minnesota University Herbarium gives evidence that *V. indivisa* was collected as early as the year 1892, at Oshawa, by Mr. Ballard, who labeled his plant *V. palmata*, just as he had done in the case of *V. Bernardi;* though these two plants are, as shall presently indicate very different, the one from the other. Again, in 1902, Mr. C. O. Rosendahl obtained fine specimens, also in the summer state only, at Spring Grove, in southeastern Minnesota. These specimens, as preserved in the University Herbarium where Mr. Rosendahl is a student, are exceedingly fine, the leaves being of an elegant cut, somewhat different from those of my type (see plate XIII). They are more evenly, rather more deeply and falcately cut; and the pubescence of the veinlets and margin are in these not obscure. Otherwise they are quite like mine. I regret that we do not yet well know the early petaliferous-flowering condition of the plant. The sheet collected by Mr. Ballard, is of the plant in its æstival stage (July), but with some abnormally late petaliferous flowers; and it is from these that I have drawn the description of the sepals. I trust it may hold for those of the early and normal flowers, when this plant shall have been detected in its normal stage.

I take this strangely marked violet to be either a recently produced specific offshoot from *V. pedatifida*, or else the survival of an ancient type of which *V. pedatifida* may be the more vigorous and the now prevailing descendant. I also regard *V. Bernardi* as in the same category; though that, but for its greater fleshiness of texture, and the pronounced hairiness of its stout petioles, might be viewed as nearer *V. pedatifida* than is the present plant. But *V. indivisa* notwithstanding its remarkable foliage, is of the thin texture and almost complete smoothness of *V. pedatifida*.

The drawing of the corollas of *V. indivisa* was made from

flowers developed in my garden at Brookland, D. C., in the spring of 1899, the roots having been transplanted from the original station by myself in the summer of 1898. The emarginate character of the petals is very probably inconstant. Such petals occur in true *V. pedatifida* now and then.

16. V. PEDATA, Linn., var. INORNATA, Greene, Pitt. iii. 35. When seven years since I was enabled to demonstrate, what all botanists for a hundred and fifty years before had remained unaware of, namely, that the plant of Maryland and Virginia with two dark velvety upper petals was typical *V. pedata,* I gave the above varietal name to what I then called the "northern plant" which differs from the southern in several particulars, and among them in never displaying any dark-colored petals.

I really ought to have been somewhat more definite as to the habitat of the variety *inornata;* for what I had in mind was the northwestern and inland plant common in the region of Lake Michigan and far to the westward. This is the "*V. pedata*" with which I was familiarly acquainted now nearly fifty years since in Wisconsin, and with my recollection of which the two-colored Potomac Valley plant, in 1896, stood in contrast.

What I would designate as the southern plant, and which extends along the Atlantic slope of the Continent all the long way from Maine to Florida, and which neither northward nor far southward seems to be two-colored as to its corolla, is either an aggregate of several species, or will at least be resolved, some day, into a number of marked varities.

The northwestern plant, seems to be less variable and certainly has a less extended range. It is never "glabrous;" a character named by Mr. Pollard in Brittons' *Manual,* and

which applies not ill to the Atlantic-slope plant. The sepals of the northwestern, or var. *inornata* are notably ciliolate; and there are other points of divergence. Its distribution is general throughout southern and western Minnesota, as the some eighteen sheets in the State Herbarium attest. On several of these sheets the specimens are mounted together with the exceedingly different *V. pedatifida;* which would indicate that the two, in Minnesota, sometimes are associated, in the field; but I do not recall ever having seen any other violet whatsoever, growing in company with *V. pedata inornata*, in Wisconsin or Michigan.

There occurs in Minnesota and Wisconsin what I can but regard as a merely abnormal condition of the plant, in which all except the very earliest of the leaves are digitately lobed instead of being pedately divided. Such a specimen is figured at plate XIV. It exactly corresponds, in so far as I can judge, to that condition of the southern plant which Pursh in his day took for a distinct species and named *V. digitata.* The drawing was made from a plant taken by myself in July, 1898, in Wisconsin. The tuft bearing these leaves was one which had evidently suffered injury from fire during the preceding autumn or early spring. The very center of the rootstocks had been burned so deeply as to have prevented any flowering of the plants that year; and these digitate leaves had sprung up from the undestroyed nodes. In the Minnesota collection there are two specimens, collected by W. A. Wheeler, in Houston Co., 16 June, 1899, which quite agree with mine in this digitate character of the leaves. That the history of their development was a repetition of that of my Wisconsin plants I dare not presume to say; but I can not regard any of these deviations from the norm of *V. pedata* as the equivalent of *V. indivisa* in relation to *V. pedatifida.*

17. V. LANCEOLATA, Linn. Sp. Pl. 934. For this no herbarium specimens are cited in the *Metaspermæ;* but there are three sheets now present; one from Hennepin Co., by Sandberg in 1890, another from Anoka Co., 1894, by W. D. Frost. The third sheet has an incomplete label, without locality or date. The indications are, therefore, that the species belongs to the southeasterly section of the State only.

18. V. BLANDA, Willd. Hort. Berol. t. 24. This white violet of open swampy meadows seems to occur in the southeastern part of the State; though how commonly it is not easy to judge from the material, much of which is so poor as to appear ambiguous between this species and the next; but there are two sheets by Sandberg from Goodhue Co., and one by Sheldon from the Mille Lacs Reservation that are indubitably *V. blanda.*

19. V. LECONTEANA, Don. Gen. Syst. i. 324. A woodland violet, larger than *V. blanda* and more freely stoloniferous, with larger corollas, but the petals narrow, seems common enough throughout the more easterly sections of Minnesota both north and south. There are some eighteen sheets which I refer to it.

20. V. RENIFOLIA, Gray, Proc. Am. Acad. viii. 288. This has been collected in Carlton Co., by Sandberg, the specimens in flower only, and at Vermilion Lake, St. Louis Co., by J. C. Arthur and L. H. Bailey, in fruit. It is of the Lake Superior region, therefore, and perhaps not uncommon there.

21. V. BRAINERDII, Greene, Pitt. v. 89. Of this recently proposed segregate there is a fair showing in the Minnesota collection, and the range is the same indicated

for the last species. There are two sheets of petaliferous-flowering specimens by Sheldon, the one from Two Harbors, the other from Tower, both in St. Louis Co., west of Lake Superior; and there is a good sheet of older specimens, taken in August, by Sandberg, at Crow Wing. Another and a fine specimen in apetalous flowering is by the collector last named, who obtained it at Carlton, in July, 1891. This specimen is mounted on a sheet with one of *V. renifolia.* Also Roberts' specimen from Black Point, 24 Aug. 1879, labelled by him "*V. rotundifolia?*," and which seems to form the chief guarantee of the occurrence of *V. rotundifolia* in Minnesota, is plainly *V. Brainerdii.*

22. V. RUGULOSA, Greene, Pitt. v. 24, 25. I founded this species on a single sheet existing in my own herbarium, which specimens bear so strong a general resemblance to *V. pubescens* rather than to *V. Canadensis* that I could not doubt about its being distinct from the latter. There are some thirty sheets of the new segregate in the Minnesota collection, the greater proportion of which were found labeled *V. Canadensis,* while one has been labeled *V. striata.* But to this "*V. Canadensis*" cover some one had transferred perhaps recently, four sheets of *V. pubescens;* this movement attesting again, that *V. rugulosa* and *V. pubescens* often so closely resemble each other that, without knowing the color of the flowers, they may get confused in the herbarium.

While there is no sheet in the Minnesota collection that exactly matches my type of *V. rugulosa* as regards copious leafiness, strictness of habit and pronouncedly rugose leaf-surface, yet a near approach to it occurs in one from Lake Minnetonka, June, 1890, by Geo. B. Aiton. The Sandberg sheet the label of which exactly corresponds to mine bears specimens younger than mine, with fewer leaves, the texture thinner, the unevenness less pronounced. But the collec-

tion as a whole abundantly confirms the species. The reniform cut of the lower leaves is universal, in some even lacking the cuspidate point. In a specimen from Center City, June, 1892, by B. C. Taylor, the two basal leaves measure more than four inches in breadth and but two and a half in length; and in many more of the specimens these dimensions are approached. The pubescence ascribed to the species is as universal. Young plants just beginning to flower, show the foliage even hoary-tomentose beneath. The rootstock does not seem to differ from that of *V. Canadensis.*

23. V. Labradorica, Schrank, Regensb. Denksch. i. part 2, p. 12. Some eight sheets of this, collected by Ballard, Sandberg and Sheldon, all from a rather limited and south-easterly district, indicate that the rolling country, more or less wooded, but with deciduous trees only, along the Misissippi, is the habitat of this species. From the westerly and distinctively prairie regions of the State there are no specimens; and we should expect none.

In the *Metaspermæ* the species was listed as *V. sylvestris*, Lam.

24. V. subvestita, Greene, Eryth. v. 39. This masquerades in recent books as "*V. arenaria*, DC.," a plant with pale-blue or nearly white flowers on peduncles three or four times as long as the leaves, and nodding, with also an obtuse spur; whereas in our North American plant the corollas are of a rather deep purple, as erect as those of any violet, and are borne on peduncles little or not all exceeding the leaves, the spur being usually acutish, sometimes almost hooked.

There are two sheets of *V. subvestita* from Two Harbors, on Lake Superior, by E. P. Sheldon, June, 1893; three from Carlton Co., in about the same region, by Sandberg, May and June, 1891, and a fourth by Sandberg, Itasca Co., 1891,

this a sheet of fine fruiting specimens. *V. subvestita* is therefore a violet of the northeastern and wooded section of the State, and need not be expected southward or westward.

25. V. CARDAMINEFOLIA, Greene, Pitt. iv. 289. Founded by me quite recently on a plant from Quebec, it is most interesting to find this inhabiting the northeastern moist wooded section of Minnesota, adjacent to Lake Superior. Two excellent sheets by E. P. Sheldon are in the Herbarium, the one from near Brainerd, the other from Nichols, both in the Mille Lac district, collected in 1892, and labeled "*V. longipes*, Nutt." Again, last year, it was obtained at Lake Itasca by Lyon and Rosendahl. It is a beautiful species, perfectly distinct from *V. Labradorica* on the one hand and *V. subvestita* on the other, and of more restricted range than either.

26. V. PUBESCENS, Ait. Kew. iii. 290. The species seems to prevail throughout western Minnesota, both north and south, as evinced by a considerable parcel of specimens, while of the analogous *V. scabriuscula* I find no trace in the collection. Some of the more imperfect specimens are to me ambiguous between this species and the next.

27. V. ACHLYDOPHYLLA, Greene, Pitt. v. 87. Although the collection contains a half dozen sheets which I readily refer to this new segregate, the best specimens of all are those constituting the type material and collected by myself, although they were in apetalous flower and fruit only. The best sheets of it in the Minnesota collection are two obtained in 1892 by W. D. Frost, one from Acton, the other from Lichfield, and neither of these was referred to *V. pubescens*, but both to *V. Canadensis!* This, it seems to me, must signify that the flowers are scarcely yellow, but perhaps almost

white in this species. The specimens are in petaliferous flower, and the petals, in the dry state, appear as if they might have been of a very pale yellow, though decidedly yellowish, not at all of the purple-tinted whiteness of those of the *Canadensis* aggregate. I also observe that the sepals in this, at least in as far as relates to petaliferous flowers, radiate away from the ovary quite as in others of the *pubescens* aggregate; so that this character is not distinctive; and V. *achlydophylla* is marked, in the main, by the dark color of its herbage, the sinuate rather than crenate margin of its leaves; probably also by the very pale yellow of its corollas. Also, its habitat is apparently peculiar, that of low woodlands, very moist. The labels of *V. pubescens*, in so far as they allude to habitat, assign it to upland dry woods and wooded hills.

I am now acquainted with some indications that *V. achlydophylla* extends eastward to western New York along the lakes.

From these remarks it will be manifest that there is wide room for careful research in the Minnesota field, both on the limits of definable species, and their geographic distribution.

I must conclude with some references to the list of violets given in the *Metaspermæ*. Certain species therein credited to the State seem to me to require confirmation as members of the Minnesota flora.

V. striata, Ait. Though credited to Minnesota in the latest edition of Gray's *Manual*, the two specimens in the State Herbarium so labeled are, in one case, *V. subvestita*, in the other *V. rugulosa*. Bradley's Spring Park "*V. striata*" is this last.

V. rotundifolia, Michx. There is no specimen of this in the collection. Of the two that are cited by number in the

Metaspermæ, collected by Roberts, one is clearly *V. Brainerdii*, the other apparently *V. blanda;* certainly one of the white-flowered violets, far enough from being *V. rotundifolia.*

V. primulæfolia, Linn. Nor is there any specimen of this; and its occurrence in the Minnesota Valley is not very positively affirmed in the *Metaspermæ.* But it is plentiful in certain localities not far beyond the Minnesota line, in Wisconsin. It must be found within the State, if indeed it has not been.

V. sagittata, Ait. Of course, all in Minnesota that has been called by this name is my western-midland segregate *V. subsagittata* and its mutation, *V. secedens,* herein first described.

V. palmata, Linn. The Linnæan species bearing this name, and common enough at the East and South, on the Atlantic slope, does not occur either in Minnesota or elsewhere in the region of the upper Mississippi.

NOVITATES TEXANÆ.—I.

The following new species, in various genera, have been collected mainly in Southern and Western Texas during the past two years by Professor S. M. Tracy.

The field, though long worked, and by a goodly number of botanists, some resident, others only traveling, is still an inviting one; and many of the genera are in need of revision. The new Verbenas, which I have found it needful to propose here, are but one example.

CLEMATIS DICTYOTA. Akin to *C. reticulata* and the foliage as conspicuously reticulate but much smaller, the raised

veins finer but of lighter color, no part of the plant glabrous, the stem almost canescently puberulent, as also the petioles and rachis of the leaves, the leaflets on both faces sparingly appressed-pubescent: leaflets small, the largest little exceeding an inch in length, others only ½ inch, round-ovate to obliquely oval, obtuse, mucronulate, the lobed ones with closed sinuses: sepals dark-purple, oblong-ovate, acuminate, densely puberulent without: carpels not seen.

Limpia Cañon, western Texas, 26 April, 1902.

Lesquerella foliacea. Perennial, the several stems erect from the base, or sometimes decumbent, 3 to 6 inches high, very leafy, silvery-lepidote, the scales orbicular, parted to the middle or more deeply into 18 and 20 setiform rays: leaves all oblanceolate, acute, about 1 inch long, both faces equally stellate-lepidote: racemes rather strict, the lower pedicels axillary to well-developed leaves, such leaves appearing at intervals all through the raceme, even to near its summit; pedicels stout, rigid, suberect: sepals narrow, persistent: pods subglobose, slightly compressed, glabrous, 2 lines high, tipped with a style as long.

Big Springs, 12 May, 1902.

Chamæcrista puberula. Stout annual, freely branching and widely, the branches several feet long, apparently decumbent, all parts of the plant puberulent: leaves not large, their leaflets in 7 to 10 pairs and crowded, oblong, or linear-oblong, very inequilateral, sharply mucronate, conspicuously almost parallel-veined, ciliate with short incurved hairs: flowers several in the axils; buds ovate, merely acute; corollas about ¾ inch broad; growing ovaries hoary-strigulose; pods about 1½ inches long, slightly curved, obtusish, appressed-puberluent.

On Galveston Island, 23 Sept. 1901. Evidently a large and maritime species.

VERBENA PLICATA. Perennial, the stoutish and rigid tufted decumbent stems 6 to 12 inches high, the whole plant canescently hirsutulous, the indument though short all spreading: leaves about an inch long, of oval blade and broadly winged petiole, the parts of nearly equal length, the blade doubly and sharply serrate-toothed, of firm texture very veiny, plicately so beneath and the veins then whitish, but not so above: spikes solitary or in threes, long and lax: ovate-lanceolate bracts exceeding the calyx, or the uppermost barely equaling it: corolla minute, scarcely exceeding the calyx, dark-blue: mature nutlets not seen.

At Barstow, 16 April, 1902. Also distributed by Reverchon in 1882, and constituting a part of his n. 737, with which, at least in the U. S. Herbarium, is one specimen of a very different *Verbena*, which may be veritable *V. canescens*, as the label has it. But *V. plicata* has characters of habit, foliage and flowers uncommonly good for a *Verbena*.

VERBENA LEUCANTHEMIFOLIA. Perennial, slender, erect strict as to the panicle of long loose slender spikes: basal, leaves of oblong-obovate outline, 1 or 2 inches long, short-petiolate, deeply and pinnately incise-toothed, strongly but hardly canescently strigose on both faces, the upper leaves of a linear rachis and a few coarse short teeth or none, these almost glabrous, as also the strongly quadrangular stem and branches: bracts broadly subulate, little more than half the length of the short calyx to which they are appressed: corollas very small, blue: nutlets of the smallest, with closely yellow-granulate commissure.

Near Abilene, 19 May, 1902. Plant next of kin to *V. angustifolia*, the sparse bristly appressed hairs of the branches and rameal leaves quite the same, but foliage in general very different.

Verbena pubera. Perennial, stoutish, the many stems decumbent, only 3 to 10 inches high, densely clothed with subsessile bipinnatifid leaves, ending in a thick subsessile spike; pubescence dense, hirtellous, somewhat viscid; ultimate leaf-segments oblong-linear; bracts short, not half the length of the calyx, lanceolate, nerveless: calyx-segments merely acute: corolla large, rose-red, the tube well exserted: nutlets large, nearly filling the short calyx.

Davis Mountains, 28 April, 1902, n. 337, typical. I also refer to the species n. 162 from the foothills of the same range. Though related to *V. bipinnatifida*, Schauer, which is a rather tall, erect annual, with a harsh and long bristly pubescence, this must be held distinct by its perennial root, and very different habit and pubescence. Mr. Tracy's n. 162[a.] may, however, be a hybrid between the two.

Verbena pulchella. Evidently a winter annual, the several stems nearly erect, 3 or 4 inches high and simple, each with 4 or 5 pairs of leaves, and a large subsessile terminal spike; pubescence rather sparse, hirsute, the calyx also minutely glandular beneath the scanty hairiness, but not viscid: lowest leaves simple, ovate, entire; those next above cuneate-obovate, petiolate, deeply 5-cleft; cauline ternately divided and the divisions trifid, the whole leaf subsessile, shorter than the internodes, about ½ inch long: bracts subulate-lanceolate, 1-nerved, appressed to the calyx, not equaling it in length; calyx-teeth short, acute: corollas large for the plant, apparently pale-pink.

Foothills of the Davis Mountains, 23 April, 1902. An elegant little species allied to *V. bipinnatifida;* possibly sometimes perennial, for it has partly the habit of that group; but in the specimens even the cotyledons are obvious, while the plants are in late flower and early fruit.

Verbena inconspicua. Allied to *V. pulchella*, larger, coarser, but the corollas small and inconspicuous; some of the leaves divided, the earliest obovate and incised, the later 3-lobed and the lobes trifid; pubescence rather softly hirsute; spikes sessile, somewhat elongated and not very dense; bracts nearly equaling the calyx, linear, somewhat spreading or deflexed; calyx-teeth subulate-aristiform and purple, the whole calyx, as also the subtending bracts hispidulous; corollas almost minute, white or pale pink.

Plains west of the Rio Pecos, 20 April, 1902, n. 106; also larger, in an alfalfa field in the Davis Mountains, 23 April, n. 178. Remarkable in this group of bipinnatifid species for the diminutive proportions and almost white color of the corollas, the tube of which does not exceed the calyx.

Mimulus inamœnus. Perennial, nearly or quite glabrous, the stout succulent stems several feet long, largely prostrate and rooting at the nodes, the flowering portion assurgent; lower internodes 3 or 4 inches long; leaves here 2 inches broad, suborbicular but with subhastate base and cuneiform petiole; earliest floral leaves nearly as large, similar in form, subsessile; slender pedicels and small flowers together at first shorter at length longer than the gradually diminishing foliage; calyx bilabiate, about ¼ inch long; corolla also small but of about twice the length of the calyx, yellow.

Limpia Cañon, western Texas, 25 April, 1902, Messrs. Earle and Tracy. The Texan Mimuli allied to *M. Jamesii* of the far northern region of the Great Lakes, seem to be several, though confused under that name by former authors. The present species, small, flowered as *M. Jamesii*, is a large, coarse plant, growing in mud. *M. Jamesii* floats on the surface of cold deep springs of the clearest water.

Gerardia Galvesiana. Annual, stoutish, rather strict-paniculate, more than a foot high; stem and branches minutely scaberulous: leaves thick and somewhat fleshy, an inch long, oblong-linear, mucronately acute, tapering at base to a short petiole, glabrous beneath, above densely scabrous with sharp somewhat appressed strongly pustulate hairs, some short ones fascicled in the axils of the lower; flowers opposite or alternate, on pedicels shorter than the calyx, this marked with obscure somewhat scabrous angles, otherwise glabrous, the teeth triangular, acute: corolla rose-purple, ample, an inch long or more, and nearly as broad, all the lobes expanded.

Galveston Island, 24 Sept., 1901.

Solidago venulosa. Radical leaves not seen; flowering stems 1 to 2 feet high, naked below at time of flowering, densely leafy above the middle, the whole stem dark dull red: leaves 2 inches long, elliptic-lanceolate, subsessile, entire, acute, glabrous except as to the serrulate-scabrous margin, subcoriaceous, minutely yet conspicuously reticulate-venulose: inflorescence subracemose in small plants, pyramidal-thyrsiform in the larger: pedicels scaberulous; involucral bracts yellow, thinnish, glabrous, in few series, all obtuse: rays quite showy, golden-yellow.

On dry hills near Weatherford, central Texas, October, 1902. One of several far-western and southwestern goldenrods that may have been referred to the eastern *S. speciosa.*

Solidago læta. Akin to *S. radula*, taller, foliage thinner, the whole herbage of a vivid lightish green: lowest leaves not seen, the lower part the green striate almost glabrous stem naked at flowering; those present varying from broadly elliptic-lanceolate and serrate in the lower, to ovate entire in the upper, all minutely roughened with scattered

short rigid sharp hairs, the margins in the entire ones closely ciliolate with more slender ones, the surface of all pervaded by a few slender light-colored feather veins: panicle short, of a few slender spreading or recurved secund racemes; pedicels of the oblong heads covered with imbricated bractlets; involucral bracts of a rich yellow, in a few series, oblong, obtuse, glabrous or at tip delicately ciliolate: rays apparently 1 or 2 only, or wholly wanting: achenes pubescent.

Dry hills about Weatherford, 10 Oct. 1902.

Platystemon and its Allies.

Eleven years ago, in the *Flora Franciscana* the genus above named was set forth as including both *Platystigma* and *Meconella;* and in the *Bay Region Manual*, two years later, I renewed the expression of this view, holding that when two specific types are so much alike in aspect and character and all else except their pistils and carpels they are not, in a natural system of classification, to be received as types of two genera.

The two Californian types which during the last half of the nineteenth century were everywhere accepted and without question, as representing, the one the *Platystemon, Californicus* of Bentham, the other his *Platystigma lineare*, have often been seen to be so exactly alike in habit, foliage, pubescence, color of flowers and form of stamens, that the best botanists, in order to be able to say which was *Platystemon* and which *Platystigma*, would be obliged to examine the pistils; even these, at the flowering stage not always so very different at first glance, as they are destined to appear when mature.

True it was, that Bentham in proposing the two genera asserted that in *Platystigma* the stamens also were very unlike those of *Platystemon*, that is, that the filaments were filiform, whereas in *Platystemon* they are so broad and flat and cream-colored as to appear almost like a set of narrower petals. Now since the time that Douglas collected these Californian types, two generations of botanists and botanical collectors, gathering *Platystigma* from a hundred different localities in California, have found its flowers always presenting filaments dilated and flattened much as in *Platystemon* itself; and so we had come to believe that Bentham and his draftsman had both erred as to one of the important characters of *Platystigma*, namely the "filiform filaments."

Somewhat recently, while recreating in the revision of early pages of my *Manual* looking to a second edition of that work, I was led to reconsider Bentham's account of the genus *Platystigma;* and I became convinced that this careful botanist could by no means have had before him a plant with the broad, flat filaments—such as our herbaria now mostly exhibit—when he defined his genus *Platystigma.* I felt not a doubt that he had been in possession of what he described, and what the artist of the *Icones Plantarum* so clearly represented, a *Platystigma* with filiform filaments. Under this conviction, I set to work upon all the herbarium material available, in hope of finding, somewhere, something answering to the original account of *P. lineare;* and the result is, the detection of several well marked species of the genus *Platystigma.*

A like inspection of hundreds of herbarium sheets of *Platystemon* has revealed as clearly or still greater number of species of that genus hitherto undescribed. And, as not only the pistils but also the stamens are always different in the two groups, I can not but propose the restoration of the two genera.

Concerning the somewhat more recently established genus *Meconella*, which Bentham declined to recognize as a genus, referring the species to *Platystigma*, I remarked in my first treatment of the group, that it has better claims to generic rank than has *Platystigma*[1]; and I here propose its restoration.

MECONELLA, Nuttall.

Slender upright branching annuals, with small white flowers on long filiform peduncles. Herbage glabrous and glaucous, only the small sepals sparsely aculeolate at summit. Leaves partly in a basal and rosulate tuft, partly cauline and opposite in whorls of three. Sepals [illegible] petals [illegible] 6; the inner 3 always narrower. Stamens normally 6, 8 or 12; when 12 the 6 outer with much shorter filaments; the filaments seldom or never obviously dilated, never petaloid. Carpels 3, long, slender, spirally twisted.

Anthers short, ovate or oval, adnate	
Corollas ¼ inch broad	
Stamens 6, uniserial, equal.	1. *M. Oregana.*
Stamens 8, the 4 outer shorter	2. *M. octandra.*
Corollas ½ to 1 inch broad	
Stamens 12, the 6 outer shorter.	
Filaments all filiform	3. *M. Californica.*
Some inner filaments dilated from base to middle and toothed	4. *M. collina.*
Anthers linear, nearly or quite as long as the filaments, these 6 only, uniserial, equal; corolla ¼ inch broad.	5. *M. denticulata.*

1. M. Oregana, Nutt. in Torr. Gray, Fl. 1. 64; Hook. Ic. t. 360. *Platystigma Oreganum*, Wats. Index, 43; Howell, Fl. 32. *Platystemon Oreganus*, Curran, Proc. Calif. Acad. 2 ser. i. 242, in small part. Plant seldom 3 inches high, the stems and peduncles filiform: rosulate-tufted basal leaves mostly spatulate, the very earliest and smallest with more distinction of rounded blade and wide petiole, none much

[1] Flora Franciscana, p. 282.

exceeding ½ inch long, 1. nerved, not reticulate, entire, the cauline smaller, oblanceolate and oblong; torus with a dilated and revolute rim or border; buds minute, less than a line long: corolla white, about ¼ inch broad, petals obovate-oblong and oblong: stamens 6, or fewer, equal; filaments filiform, not flattened, rather more slender at base and gradually thicker under the oval adnate anthers.

The species is known to myself only as inhabiting Oregon and Washington. But in Gray's *Synoptical Flora* it is said to range northward to British Columbia.

2. M. OCTANDRA. The rather few ascending and almost filiform branches 3 to 5 inches high; rosulate basal leaves very small, the proper blade rounded, the petiolar part narrow-linear; cauline leaves larger, mostly spatulate, none linear, the uppermost oblong: torus-rim evident but not prominent; corolla apparently white, ¼ inch broad, the 3 outer petals widened from a narrow base to almost flabelliform, in expansion their margins nearly meeting, overlapping the 3 inner and concealing them as viewed from the outside: stamens about 8, the 4 outer shorter.

The type specimens of this were obtained by Miss Eastwood, in Tulare Co., Calif., one sheet from Salt Creek, a tributary of the Kaweah River, this in 1894; the other from near Kaweah in 1895. There is also a fruiting specimen, probably to be referred here, collected by Brandegee, at Cramer, in the same county, in 1891. The species is extremely well marked by the great width of its small petals; the outer overlapping the inner, quite as in most Eschschotzias, but as in no other *Meconella*.

3. M. CALIFORNICA. Torr. & Frém., in Frém. 2d. Report, 312; Torr. Pac. R. Rep. iv. 64 in part, excl. pl. Thurber. *Platystigma Californicum*, Wats. Index, 43. *Platystemon*

Torreyi, Greene, Fl. Fr. 283 in part. Plant 2 to 6 inches high, the rosulate basal leaves with small round-ovate blade and long linear petiole, only faintly 1-nerved the cauline oblong and linear-oblong: torus with inconspicuous plane rim: corolla white, about ½ inch broad; petals obovate, the inner ones narrowly so: stamens 12, the 6 outer shorter, all with linear filaments which are narrower rather than broader under the short oval anthers.

This, the second species of the genus from the point of view of its history, has a very extended range up and down the foothills east of the great interior valley of California, from the base of Mt. Shasta southward. For the sake of the consistencies of the geography of the genus, one could wish that the species were absolutely restricted to that habitat; but Mr. C. F. Baker last year distributed, under n. 457, and with the name *Platystemon Torreyi*, from Crystal Springs Lake, in the coast hills of San Mateo Co., a plant which I can not find referable elsewhere than here; though from the habitat, it would be expected to be the next species, *M. collina*, of which, however, it has not the essential characters. But it will not be a quite solitary instance in which a species ordinarily limited to the Sierra foothills, has been found at some isolated station in the Coast Range also.

I am suspicious that the species as I here present it is something of an aggregate; that some of the specimens from the most southernly localities will some day be found to represent one or more distinct species, the characters of which may disclose themselves to such as make careful study of the living plants in the field.

4. M. COLLINA. *M. Californica*, Torr. Bot. Mex. Bound. 31, also of Pac. R. Rep. iv. 64 as to Pl. Thurber, but not of Torr. and Frém. *Platystigma Californicum*, Wats. Index in part, and of Boland. Catal. wholly. *Platystemon Torreyi*,

Greene, Fl. Fr. 283 mainly. Plant 4 to 10 inches high, freely and sometimes almost diffusely branching, the basal leaves few and not rosulate, mostly spatulate, the cauline many, usually in whorls of 3, or in pairs, $\frac{3}{4}$ to 1 inch long, many-nerved, the nerves apt to run together and form an elongated reticulation: torus-rim not obvious: corollas white, 1 inch broad, the petals obovate: stamens 12, unequal, those of the inner series with filaments dilated at base, the dilatation ending at or below the middle of filament in a pair of salient subulate teeth; anthers short and adnate.

This fine species, exhibiting by much the largest flowers in the genus, is apparently confined to the coast hills of Middle California, particularly in the immediate vicinity of San Francisco. About the best specimens extant are those collected many years since, in the San Bruno Hills, by the late venerable Dr. Albert Kellogg.

5. M. DENTICULATA, Greene, Bull. Calif. Acad. ii. 59. *Platystigma denticulatum*, Greene, Bull. Torr. Club, xiii. 218; Gray, Syn. Fl. i. 85. *Platystemon denticulatus*, Greene, Fl. Fr. 283. Plant 3 to 10 inches high, erect, parted above into many filiform branches and peduncles: rosulate basal leaves with rhombic-ovate blade and longer linear petiole, the former notably reticulate-venulose, entire or with a few teeth; cauline mostly in whorls of 3, spatulate to linear, obtuse, denticulate: torus with no rim: corolla white, about $\frac{1}{4}$ inch broad; petals oblong: stamens about 6, in one series and equal; filaments short, linear or somewhat subulate, not longer than the elongated and linear innate anthers.

This fine species, established upon a goodly number of strong characters, is well distributed throughout southwestern California, extending to several of the coast islands, and northward on the mainland to Monterey Co. (Gonzales, J. B. Hickman, and Castroville, T. S. Brandegee). It is the only

species whose anthers are not short and manifestly adnate; here they are greatly elongated, oblong-linear or linear, and apparently innate. No other is, like this, devoid of any torus-rim. No other shows the leaf-margin otherwise than entire. This last character is not, however, very constant; for out of sixteen sheets of specimens examined by me in the course of this revision of the species, two present leaves all quite entire, while most of the others show some or all of the leaves dentate. But the actual type-specimen, collected by myself in Temecula Cañon, San Diego Co., in 1885, is the only one yet seen by me in which the foliage is strongly and conspicuously denticulate.

Coming now to the consideration of *Platystigma* I repeat the statement of my conviction that heretofore, in supposing our most common and familiar species with broad cream-colored petaloid filaments to be the type species of the genus I have erred, as have others. It was on these characters of the filament in this—characters so almost exactly those of the same organ in *Platystemon*—that we abandoned the former genus as not valid.

Satisfied that Bentham's type of *Platystigma* is a plant, now comparatively unknown, and possibly extinct where Douglas obtained it seventy years since, exhibiting truly filiform filaments, it follows that one must accept as a species hitherto unnamed and undescribed the familiar one. This, indeed, as it appears in the herbaria now somewhat copiously, easily resolves itself into several species, all new.

Whenever a genus supposed to be monotypical is found to embrace several species, the validity of the genus is thereby strengthened; and having found that *Platystigma* resolves itself into a genus of perhaps a half-dozen species, and that *Platystemon* as now known is made up of four times that number, with no species on either side seeming any more transitional than were the originals themselves, there is no

longer any room for doubting the validity of both genera.

In restoring *Platystigma* it is discovered that this name, as Bentham and others following him have employed it, is a homonym, the *Platystigma* of Robert Brown antedating it by two years. I therefore assign to Bentham's *Platystigma* the new name

HESPEROMECON.

Low annuals, erect or decumbent, with smallish mostly cream-colored flowers on hirsute (rarely hispid) peduncles usually elongated much beyond the commonly short leafy branches and appearing scapiform. Herbage pale, glaucous, never glabrous, though often only sparsely pilose. Leaves never rosulate, but often by the shortness of the branches appearing in a dense upright tuft; but the internodes sometimes obvious, and the leaves always opposite or ternate. Sepals and petals, [redacted] six, the former always hairy, at least at summit. Stamens indefinitely numerous, the inner successively a little longer; filaments filiform in the type-species, variously dilated in the others, thin and translucent, not colored and petaloid. Carpels 3, short and somewhat turgid, not twisted.

Filaments filiform; stigmas short, ovate ....1. *H. lineare.*
Filaments linear; stigmas long, lance-linear...............2. *H. affine.*
Filaments elliptical, not longer than the anthers.........3. *H. platystemon.*
Filaments oblong-linear, longer than the anthers:
  Corollas white or cream-color—
    Capsules long, elliptical...................................4. *H. strictum.*
    Capsules short, rhombic-obovate ....5. *H. angustum.*
  Corollas yellow; capsules elliptic-oblong...............6. *H. luteolum.*
Filaments winged, the wings truncate below the anther..7. *H. pulchellum.*

1. H. LINEARE. *Platystigma lineare*, Benth. Trans. Hort. Soc. n. ser. i. 407; Hook. Icon. i. t. 38, not of Lindl. Bot. Reg. t. 1954; of more recent authors in part only. *Platystemon linearis*, Curran, Proc. Calif. Acad. 2 ser. i. 242, and

Greene Fl. Fr. 282 as to name only. Slender annual 3 to 7 inches high with narrow-linear tufted leaves and scapiform peduncles: corolla ¾ in. broad, widely expanding but with slightly turbinate base, the obovate yellowish petals being somewhat cuneate at base: stamens about 12 or 15; filaments filiform, much longer than the oblong-linear anthers; capsule rhomboid-oval, barely ½ inch long; stigmas ovate-lanceolate.

This species, distinguished from all the others by its filiform filaments, is the rarest of all in collections, being known, as far as I can learn, only by specimens of Douglas' collecting—no one knows just where—and by others obtained by Mrs. Curran somewhere near Tehachapi in 1884. It seems probable that Douglas gathered his in the latitude of Tehachapi, to the westward of it, in crossing the elevated country, on his journey between Monterey and Santa Barbara. While it is not to be doubted that the original material as studied by Bentham was of a plant with filiform filaments, it is nevertheless evident that Douglas gathered at least one specimen of some one of the new species herein proposed; for Asa Gray, in the Torrey & Gray *Flora.* p. 65, remarks that in the specimen in his possession the filaments "are dilated, and linear-oblong or lanceolate, instead of filiform." To which of the species this perhaps single Douglasian specimen with broad filaments may belong is not, however, important.

2. H. AFFINE. Habit of *H. lineare,* but peduncles stouter and taller, the foliage comparatively short and broad: corollas apparently white or cream-color, saucer-shaped, the obovate petals not narrowed at base; stamens about 24; filaments narrowly linear, hardly filiform; stigmas long and narrow, lanceolate, even narrowly so, nearly or quite as long

as the mature capsule, the latter ½ to ¾ inch long, nearly elliptical.

Species very well marked by its narrow-linear filaments, and especially by its stigmas which are as narrow as in some species of *Platystemon*, and greatly elongated. It is known to me only as collected by Miss Eastwood at Exeter, Tulare Co., Calif., 26 April, 1895.

3. H. PLATYSTEMON. *Platystigma lineare*, Gray, Syn. Fl. in part, not of Benth. *Platystemon linearis*, Curran, Proc. Calif. Acad. 2 ser. i. 242 and Greene, Fl. Fr. 282 and Man. 10 in part, and as to the plant about San Francisco only. Leafy branches very short, greatly surpassed by the stout, mostly ascending rather than erect peduncles, the whole 4 to 8 inches high; peduncles sparsely hirsute: buds exactly oval, sometimes narrowly so: corollas dull-white an inch or more in breadth, widely expanding, the petals all obovate and sessile, the 3 inner not much narrower than the outer; stamens about 18, all of equal length; filaments broader than the anthers and not much longer, elliptical, the anthers inserted on an abrupt acumination: capsule ½ to ¾ inch long, ellipsoidal; stigmas ovate, very acute.

Species apparently local on the San Francisco peninsula; distributed long ago by Dr. Kellogg; later by Miss Eastwood, and also by Mr. Bioletti; an excellent sheet in U. S. Herb. purports to have been gathered in "California, G. R. Vasey, 1875," and is no doubt from San Francisco.

The collectors, all but one, in so far as I see, fail to name any special locality in or about San Francisco for this fine plant. Mr. Bioletti names Lake Merced. During all my years of residence in that vicinity, while familiarizing myself with almost all the best suburban botanizing grounds, I never once met with the plant. As the *Meconella* that is local there is the most showy member of its genus, so also

this San Francisco *Hesperomecon* surpasses all the other species in the size of its corollas, though not the largest of them as to general stature.

4. H. STRICTUM. Taller than the last, ½ to 1 foot high, the scapiform peduncles longer in proportion and strictly erect; leaves also erect, narrowly linear, notably callous-tipped: buds round-obovate, strongly nodding: corollas an inch broad, cream-color or even yellowish, the obovate petals not very dissimilar: filaments oblong-linear, pointed at the insertion of the anther, long in proportion to the anther; capsule ¾ inch long, mostly of exactly oblong outline: stigmas ovate.

Southern homologue of *H. platystemon*, differing from it chiefly in so far as herbarium material makes plain, in its more strict habit, round-obovate buds, and longer stamens with narrower filaments. It is known mostly from San Luis Obispo and adjacent counties, the oldest good specimens seen having been obtained by Parry, on the Mexican Boundary Survey, at the town of San Luis Obispo, in 1850. Others as good, and from the same county, are in Herb. Calif. Acad. by Miss Miles in 1886, and Miss Eastwood in 1896. Since this very region must have been traversed by Douglas on his way between Monterey and Santa Barbara, and since at least one of his specimens was seen by Asa Gray to have linear-oblong filaments, it appears as if this might have formed a part of the original *Platystigma lineare*, though not observed by Bentham.

5. H. ANGUSTUM. Very slender, 4 to 8 inches high; leaves from narrow-linear to linear-filiform, ending in a blunt callosity, scarcely pubescent: scapes weak, often half reclining in age, notably hirsute: corollas cream-color, ½ to ¾ inch broad, the petals abruptly cuneate at base: filaments

lance-linear, longer than the anthers: capsules less than $\frac{1}{2}$ inch long, rhombic-obovoid, stigmas ovate-lanceolate: seeds obliquely pyriform.

The type specimens of this were collected by myself, on low sand-hills along the San Joaquin River above Antioch, Calif., 17 April, 1887; and Mr. Carl F. Baker has this year obtained specimens of it from the original station, though small ones. It appears also to have been distributed by Dr. Kellogg long ago, from the sandy wastes about Alameda, as they existed several decades ago, and where the plant is doubtless long since extinct.

6. H. LUTEOLUM. Rather firmly erect and not particularly slender, 7 to 10 inches high, the scapes hirsute with short ascending hairs: leaves not very narrow, scarcely 2 inches long, obtuse: corollas yellow, 1 inch broad, cup-shaped, the oblong-obovate petals being narrowed to a short claw: filaments linear-oblong, twice the length of the anthers, or those of the outer series shorter and elliptical: stigmas ovate-lanceolate, the capsule $\frac{1}{2}$ inch long, elliptic-oblong, scarcely wider above the middle.

Known only from Ben Lomond, Santa Cruz Co., Calif., and from near Castroville, Monterey Co., collected only by T. S. Brandegee, in 1889 and 1890.

7. H. PULCHELLUM. Evidently caulescent, the branches with 3 or 4 distinct, and even somewhat remote leafy nodes, the peduncles comparatively short; both leaves and peduncles sparsely hairy: corollas an inch broad, saucer-shaped, the 3 outer and broader petals yellow, the three inner narrower and white, all of obovate outline: stamens indefinitely numerous; filaments ligulately dilated from base to near the summit, the dilatation ending truncately a line's length or less below the insertion of the oblong retuse anther: stigmas lanceolate.

Known to me only as figured and described in the *Botanical Register*, xxiii. t. 1954 as *Platystigma lineare*, the original of the plate having been grown in England in 1837, from seeds sent in the first instance from the Russian Colony, on what is now Russian River, in Sonoma Co., California.

White-flowered and yellowish-flowered species occur; but none are yet known except this, the flowers of which are thus markedly two-colored; nor any with stamens making any approach to these in character. Yet, unless very local at first, and now become extinct, just this species will be found again, some day, at or near the original station; one which, I think, no botanist or collector has revisited during all the last sixty or seventy years.

This species, here first defined, seems to have been the first of its genus ever cultivated and seen alive in Europe; for Douglas, the discoverer of the true *H. lineare*, sent to his patrons no seeds of it, as Lindley informs us in the place cited.

Platystemon has hitherto been allowed to pass for a genus almost or altogether monotypical. The continued prevalence of such a view, at least in recent years during which the known range of the genus has been vastly extended, and specimens in the herbaria have been multiplied twenty-fold, has been owing entirely to negligence on the part of botanists; negligence fostered by the old prejudice engendered by the dogmatism of two or three generations of taxonomic "authorities" who have said that there was but one *Platystemon*.

Bentham, who founded the genus on plants derived from Monterey, although there is evidence that he had two pretty clear species in hand, was yet so sure there was but one, that he did not vouchsafe a specific character; assuming

that the generic character would suffice; as it will when a genus really is monotypic.

But coming down sixty-five years, from Bentham's date of publication to that of Asa Gray in the *Synoptical Flora*, although *Platystemon* material is now in hand from all over a stretch of territory equal in extent to nearly half of Europe, and showing great diversities as to flower and fruit, and even of habit and foliage, still no real specific character is given. The difficulties of the situation are evaded. The task that would then have cost a careful and conscientious taxonomist three months' if not a half year's arduous toil is left undone. Ten good species, if not twenty or forty, might be embraced within the limitations of the pretended specific definition in the work cited (p. 84); and this, I repeat, is no specific character at all. Nor are my own in the *Flora Franciscana* and the *Manual* much better. All that can be said in extenuation of their faults is, that in neither was there a dealing with plants of more than a very limited area, the species appertaining to which, had they all been defined, would not have been so numerous.

Platystemon, according to the plentiful data now at hand, ranges from a little below Cape San Quentin on Mexican territory, northward to Cape Mendocino in the northern part of California, a distance of some 850 or 900 miles; while at the north the belt extends inland across two or three mountain ranges 200 miles, and to the southward across to Nevada, Utah, and Arizona, some 500 or 600 miles. This area may be about equal to that of the States and provinces from the southern peninsula of Michigan across to Massachusetts and southward to the Gulf of Mexico and northern Florida. On the continent of Europe, Spain, Portugal, and France, with the Netherlands and some part of England together, would represent about an equal area. But neither in any part of Europe, nor on the Atlantic slope of North

America, will the same extent of country be found to present half the diversities of soil, climate, altitude, etc., which are to be found within the limits of the distribution of *Platystemon*. Even as to the immediate seaboard extension of its range the genus runs through five distinguishable floral belts; one marked by Cape Mendocino and Point Reyes; another between Point Reyes and Point Pinos at Monterey; a third defined by the latter and Point Conception, above Santa Barbara; a fourth between the last named headland and Point Loma at San Diego; the fifth between that and Cape San Quentin. Each of these belts contains its own local species in several genera, and is readily definable as a floral belt. But, leaving the maritime sections, where *Platystemon* in several species flourishes in the moist sea air, and even under the influences of the salt spray, we find others in the coast range of mountains subject to copious rains and heavy fogs; then again as many more on the climatologically distinct region of the great sunny and rather arid, yet fertile plains of the interior of California, the plains of the Sacramento in the northern, and of the San Joaquin and its tributaries in the southern. The foothills of the Sierra to the westward of the interior plain have again no dearth of *Platystemons*. They seem to lack representation on the subalpine and alpine heights of the Sierra Nevada, yet occur again in quite a multiplicity of species amid the parched deserts of Nevada, Southern Utah, and Arizona.

Antecedently it would seem impossible to one having any idea of the extremely distinct floral regions here hinted at, that in any genus of flowering plants a type could in the lapse of ages disperse itself over all of them and remain a specific unit.

A careful examination of materials that have been brought together from all these diverse fields—a study that has involved laborious weeks and months of time—has brought to

light abundance of characters, such as must have been seen by others, and even by myself long ago, but for that blind indifference that is born of our prejudices; such characters as, once seen and accorded the weight that is due them, must compel the recognition of half a hundred species as represented in various herbaria at this date.

While all known forms of *Platystemon* are annual as to duration, and are equally at agreement as to the general type of foliage, yet even as to habit and foliage a very considerable number of marked diversities have now for the first been brought to light in this my first real examination of the plants. As to habit, some species are loosely branched, leafy throughout, and bear their flowers on relatively short peduncles. Other species are subacaulescent, with crowded basal leaves and long scape-like peduncles. The leaves of some are broad and obtuse, of others narrower, tapering and pronouncedly callous tipped. There are many sorts with herbage merely pilose-hairy, and also a considerable group in which the whole plant is crinitely soft-hairy; while a single species, endemic on an island in the sea is not at all hairy, but rather prickly. The peduncles in some are stout and rigidly erect; in others almost filiform; and, being erect after flowering in the greater proportion of the species, there are a half dozen in which they are nodding in fruit. The corollas in most are rotate, or at least saucer-shaped, their petals being sessile, but in a goodly number these organs are so distinctly narrowed to a shorter or longer claw that the expansion of their corollas is like that of a lily, and not at all that of a poppy or any other papaveraceous plants. The corollas, together with the stamens are commonly deciduous (though never fugacious as in many poppyworts), while in a multitude of other species they persist, along with the stamens, as a permanent covering to the mature fruits; the carpels even in many an in-

stance breaking up and falling away, while the floral envelope remains still in place. While this character of the persistence of the corolla is not absolute; while, for example, in the naked-fruited species a few of the latest and reduced infertile flowers show persistent petals, and while the very earliest and most vigorous flowers in the marcescent species, seem promptly to shed their petals and their stamens, yet the character is a positive one, and can not safely be ignored; for in the herbarium certain species always show at least the great multitude of their petals marcescent, and certain others are as distinctively naked-fruited. And let those who delight in theorizing as to the causes of those diversities, and the conditions under which characters originate, explain this: that the naked-fruited *Platystemon* species are distributed partly along the seaboard, under the influence of the fogs and rains and sea-spray, and partly in the deserts of Nevada, Utah and Arizona and Mexico; whereas the species whose carpels in maturity are covered up under persistent petals and stamens, are those of the coast range of mountains partly, and partly of the only moderately arid sections of the fertile interior plain of California. The very extremes of humidity and aridity present us with the naked-fruited Platystemons.

As to the filaments, the usually dilated and petaloid character of which suggested the name of the genus, there is very great diversity of form, as there are likewise considerable differences in different species as to the anthers themselves. What these differences are will be seen in the diagnosis of the several species. The like is true as regards the carpels themselves, which, in a number of species, are scarcely torulose, in others strongly torulose, in many most strictly and beautifully moniliform. Some are strongly carinate dorsally, others not in the least so. The sides of some are traversed by delicate lines, those of others marked

with turgid straight ridges, of others with curiously interrupted, or sometimes continuous cristate markings, some with finer lines and intervening tuberculations. The carpels of many are pale and glaucous-green even when breaking up and falling to pieces; others are brown or black at that stage; and finally, while in most species the carpels are glabrous, in some they are variously pilose, in some very hirsute, in at least one, prickly. In their relation to each other the carpels form a single whorl, the members of which, though theoretically follicular and distinct as those of an *Aquilegia* or a *Caltha*, are really united in the flowering stage, and often even in maturity, at least by their style-like terminal part on which rests the stigma, thus together forming a cavity which, however, is not completely closed; and within this cavity, so completely resembling that of a one-celled capsule, naked seeds are often matured, so that the carpels are at once individual follicles, and by partial cohesion formed also into an actual capsule. In these cases the ventral suture of each ovary, with its placental lines, has failed to close at the very margin; though from a little back of the margin it is closed, and the usual one-seeded closed joints are perfectly formed.

Occasionally in the diagnosis of species I have mentioned the styles. All my predecessors have, I think, treated of the stigmas as being sessile.

The stigmas themselves, in the different species, exhibit much diversity. In some they are as long as the body of the carpel and filiform. In others they are shorter and linear, or subulate, or even almost lanceolate.

Regarding the affinities of *Platystemon* a word must be offered before proceeding to discuss the species. With the exception of its geographical associates, *Meconella*, *Hesperomecon* and *Canbya*, all of which are of course intimately related, it is difficult to name a manifest ally of *Platystemon*.

Between it and the most conspicuous of West American papaveraceous genera, *Eschscholtzia*, there is so little resemblance that it is not easy for an unbiassed mind to reconcile them as members of the same natural family. For a genus in any way analogous to *Platystemon*, looking to the Mediterranean region of the Old World, we find it in *Hypecoum*. Here we have a similarly articulated carpel made up of one-seeded joints. It is, however, a mere analogy; for the habit of *Hypecoum*, its floral structure and all are so different that no one with any correct notions of plant affinities would ever pronounce them to be near allies. But, however widely differing from the papaveraceous type in the character of its fruits, as well as in the matter of its entire and opposite or whorled leaves, its flower-buds bear the closest resemblance to those of *Papaver* itself; so that a botanist, supposing him to see for the first time a well developed *Platystemon* plant just beginning to flower, and still exhibiting a great number of buds, if he do not stop to examine the pistils, must inevitably judge the plant to be at least a very near ally of *Papaver* itself. And I believe this judgment to be as good as any; and that *Platystemon* is indeed nearly allied to the very type of the Papaveraceæ.

The subjoined attempt to distinguish and classify the species of *Platystemon* is the result of months of laborious examination and comparison of a great wealth of herbarium material. My own herbarium, at the inception of the task, was rich in unstudied material chiefly of my own collecting during years of residence in California. The equally seviceable bundles of the United States herbarium here in Washington were of course readily accessible; and from California there have been placed at my disposal the private collection of Mr. Samuel B. Parish, of San Bernardino and that of the California Academy of Science at San Francisco; this last doubtless by far the most extensive

and important collection of *Platystemon* in existence. Without that, any attempt to revise the genus would have been necessarily abortive.

While finding it impossible to avoid the proposing of a great number of species, the attempt to arrange them in any thoroughly natural sequence has not resulted satisfactorily; and the key is largely artificial; but I could do no better.

PLATYSTEMON, Bentham.

Annuals, mostly freely branched and decumbent or procumbent, not rarely quite upright, with tufted but erect leaves and scapiform peduncles. Herbage pilose or hirsute, in several densely and crinitely so, in a few almost or quite prickly. Leaves linear, either obtuse, or acutish and callous-tipped, always entire and opposite or in whorls of 3. Sepals 3 and petals 6, both occasionally more numerous. Color of flower creamy-white to yellow, and even particolored yellow and white. Stamens very many, unequal, mostly with broad petaloid filaments dilated upwards. Carpels 9 to 20 or more, in maturity torulose or moniliform, breaking into 1-seeded joints, or in some continuous and quite siliquiform, the whole circle often forming a hollow falsely capsular and seed-bearing cavity. Stigmas linear, hirtellous.

* Carpels turgid, not moniliform (nearly so in n. 2), merely torulose, or even hardly so and quite siliquiform, dull dark brown in maturity (pale and glaucous in nn. 7 and 9), the sides without definite marking. Petals and stamens deciduous, at least as to all but the latest flowers (except in n. 10).

Outer filaments obcordate, scarcely longer than their linear sessile anthers.................................. 1. *P. Californicus.*

Outer filaments obcordate, longer than their often stipitate anthers ....10. *P. purpuratus.*

Outer filaments merely obtuse; anthers short........ 3. *P. villosus.*

Outer filaments long and narrow, emarginate or obtuse under the long linear anthers;

Carpels elongated, many-jointed;

strongly torulose, glabrous, straight............. 2. *P. leiocarpus.*

torulose, glabrous, twisted .... 19. *P. contortus.*
torulose, not twisted,
sparsely pilose .... 5. *P. Petrinus.*
setose-hispid .... 6. *P. rigidulus.*
minutely prickly .... 7. *P. aculeolatus.*
loosely hirsute ;
Stigmas short, stout .... 22. *P. confinis.*
Stigmas long, slender ;
Petals broad, obovate .... 23. *P. Mohavensis.*
Petals narrow, elliptical .... 24. *P. anemonoides.*
Carpels even and siliquiform rather than torulose, not glabrous ;
stout, erect, strongly pilose .... 4. *P. capsularis.*
slender, divergent, lightly pilose .... 49. *P. nutans.*
Carpels short, few-jointed, glabrous ;
divergent, the joints obscure .... 8. *P. ornithopus.*
erect, the about 4 joints obvious .... 9. *P. sphaerocarpus.*

* * Carpels turgid, moniliform (barely torulose in nn. 35 and 36), mostly pale and glaucous in maturity, or with a dark dorsal line (wholly blackish in n. 18), the sides variously rugose or cristate-roughened.

+– Petals and stamens deciduous.

Filaments, all long and narrow, with rounded terminal lobes or none.
Carpels with dark dorsal line ;
sides indistinctly subcristate-rugose .... 11. *P. communis.*
sides irregularly but distinctly wrinkled .... 12. *P. tortuosus.*
sides turgidly undulate-rugose .... 13. *P. tessellatus.*
Carpels with delicate dorsal nerve, and thin straight lateral wrinkles .... 14. *P. proximus.*
Carpels wholly blackish, evenly and closely turgid-striate .... 18. *P. nigricans.*
Carpels long, many-jointed, green, with no dark dorsal line;
corky-rugose, glabrous .... 20. *P. crenatus.*
obtusely carinate, hirsute .... 21. *P. commixtus.*

Filaments broad, at least the outer, and these sharply notched at summit, the anthers sessile between the acute lobes.

Carpels glabrous;
with obtuse midnerve and turgidly subcristate-rugose sides .... 15. *P. emarginatus.*
with no midnerve, the sides with more or less distinct thin wavy wrinkles .... 17. *P. arvorum.*
Carpels more or less hirsute .... 16. *P. quercetorum.*

+ + Petals and stamens persistent. Petals sessile, corollas rotate or saucer-shaped.

Herbage densely and crinitely hirsute.

Outer filaments notched; anthers long, linear ....27. *P. crinitus.*

Outer filaments obcordate; anthers short, elliptical..28. *P. Hyacinthinus.*

Herbage lightly hirsute or pilose.

Carpels moniliform, pale, and glaucous, turgidly wrinkled.

Outer filaments spatulate-linear, merely retuse; anthers sessile..............................29. *P. Antoninus.*

Outer filaments deeply notched.................30. *P. Mendocinus.*

Outer filaments 3-toothed, the middle tooth bearing the anther...............................31. *P. heterander.*

Carpels moniliform, mostly dark-colored, their sides more coarsely rugose or otherwise roughened;

obtusely carinate, the sides sinuately subcristate rugose.......................................32. *P. glyptolobus.*

obscurely carinate, laterally cristate-sculptured in the middle of each joint...........33. *P. exsculptus.*

obtusely but strongly carinate, and with strong turgid obtuse rugosities...............34. *P. rugosus.*

Carpels without regular lateral markings, and dark-colored;

torulose, pectinate-setose up and down the back ....35. *P. pectinatus.*

somewhat moniliform, glabrous, corky-looking and amorphous-roughened........36. *P. subereus.*

* * * Carpels strongly moniliform, with small, closely compacted joints thin-walled, green and glaucous usually, commonly delicately lineolate, never notably rugose or wrinkled.

+ Petals and stamens persistent—

Carpels with strong obtuse midnerve and smooth sides..37. *P. pilosellus.*

Carpels loosely and delicately wrinkled.....................38. *P. penicillatus.*

Carpels with filiform, dorsal and lateral lines............39. *P. obtectus.*

+ + Petals and stamens deciduous—

Petals unguiculate; corolla turbinate at base;

Filaments acute under the anther.......................40. *P. acutatus.*

Filaments obtuse or emarginate under the anther;

Carpels glabrous, delicately lineolate...........41. *P. turbinatus.*

Carpels soft-hirsute and with stronger lineation ....26. *P. horridulus.*
Carpels hirsute; marking not known............47. *P. australis.*
Petals sessile; corollas rotate or saucer-shaped.
Fruiting peduncles erect;
Corolla white; filaments often toothed at summit ....42. *P. leucanthus.*
Corolla cream-color or yellow; filaments narrow, obtuse.
Petals broadly obovate.
Carpels lineolate, obscurely tuberculate between the lines........45. *P. remotus.*
Carpels smooth, even the dorsal nerve obscure........43. *P. microlobus.*
Carpels finely lineolate only........44. *P. Arizonicus.*
Petals narrow, oblong to elliptical.
Carpels delicately wrinkled........25. *P. elegans.*
Carpels obscurely both lineolate and tuberculate 46. *P. leptander.*
Fruiting peduncles nodding.
Carpels long and slender, many-jointed, hirsute to almost glabrous........48. *P. verecundus.*
Carpels short, forming an oval or oblong fruit;
carinate, otherwise even, short-hirsute.......50. *P. hispidulus.*
lightly carinate and closely-wrinkled, hirsute........51. *P. cernuus.*
delicately lineolate, glabrous........52. *P. setosus.*

1. P. CALIFORNICUS. Benth. Trans. Hort. Soc., 2 ser. i. 405, 406, in part; Hook. Bot. Mag. t. 3579 ; Torr. & Gray, Fl. i. 65, excl. vars. *lineare* and *leiocarpum*. Seldom a foot-high, loosely branched, decumbent, the branches stout, fleshy, glabrous: leaves linear-oblong, about 1½ inches long, often ½ inch broad, very obtuse, even occasionally retuse, rather closely hispid-ciliate with ascending hairs, otherwise nearly glabrous: peduncles little exceeding the leafy branches, stout, sparsely almost hispid-hairy with short, stiff, slightly ascending hairs: corollas 1 inch broad, saucer-shaped, the obovate petals cream-color, with a yellow spot at base: stamens very unequal, the outer filaments scarcely half as long as the inner, not longer than their linear anthers and obcordate, the inner spatulate-oblong, merely obtuse; both

petals and stamens deciduous: fruit oblong, an inch long, of 9 to 11 large and turgid carpels equably but sparsely pilóse-hispid from base to apex, lightly constricted, merely torulose, not moniliform, traversed dorsally by a low, broad, dark line, usually about 9-jointed, the joints neither quite smooth nor very definitely wrinkled on the sides.

In so far as I can ascertain, this plant does not occur except as almost or quite maritime at and near Monterey. I take it to be one of a goodly number plant species recognized as being local there. In the herbaria it is a rare species. During my own sojourn of a few days at Monterey in May, 1895, I did not meet with it; but the best specimen I have seen of it was collected at Pacific Grove in 1893 by my pupil, Mr. Tidestrom. Very excellent ones are distributed this year by Mr. Heller, who has done well in spending this spring in collecting on this classic ground. He says of this that its habitat is "along the beach, exposed to the spray, the plants usually prostrate."

Such a plant as this here described will be found not to match exactly the figure in the *Botanical Magazine,* where the leaves are lance-linear rather than oblong, and acutish rather than very obtuse. But I can imagine an English-garden-grown plant of this species to present foliage narrower, thinner and less obtuse than that possessed by its parent on a sandy seashore exposed to the salt spray. But Bentham's type, direct from Douglas, is said to have leaves "oblong-lanceolate, obtuse." So also Asa Gray, as cited above, with Douglasian material in view, describes the leaves as "linear-oblong, very obtuse." The material which I describe and cite is, therefore, answerable to the originals as they are described; at least, to that part of the original material on which the species was mainly founded. But this Bot. Mag. figure is in another particular unsatisfactory. Its stamens were drawn at least very carelessly and blun-

deringly for those of what I assume to be *P. Californicus;* for, while as outlined roughly and in mass in the figure of the flower they may be guessed to have been short and obcordate, when it comes to the two of those organs that are figured apart from the flower, neither one at all represents an outer-series filament of this species. If this came to pass through neglecting to note the strong difference between outer and inner filaments it was an unfortunate piece of somebody's carelessness; quite as bad a blunder as is made in the text accompanying the figure, where the writer says of the filaments that the "inner ones are gradually broader." Exactly the reverse of this is always the case.

Upon the whole, I have been tempted to write a question mark after my citation of this Bot. Mag. t. 3579. Yet, I feel scarcely a doubt that this plant is what they had in view, but in the representation of which they were more careless than they should have been.

If above I have not cited the usual Bot. Reg. t. 1679 for *P. Californicus*, it has been for the reason that that represents clearly a different species; though it appears to have been mixed with the original materials sent by Douglas, and to have been grown in England from seeds sent by him, and is also known to this day only from the vicinity of Monterey. I shall discuss this hereafter under the name of *P. purpuratus.*

2. P. LEIOCARPUS, F. & M. Ind. Sem. Petr. (Dec. 1835), p. 47; Hook. Comp. Bot. Mag. ii. 8; Linnæa, Litt. Ber. (1837), p. 117. Of the size and with the habit of the preceding, the leaves equally broad, short and obtuse, but more nearly glabrous, scarcely ciliate: corollas quite the same, but the filaments different, none obcordate, even the outer series much longer than their anthers, cuneate-oblong, merely retuse or even obtuse at summit, the inner similar but longer and narrower: carpels about 12, usually glabrous,

often with here and there a bristly hair, more constricted, the joints with similarly indefinite unevenness of surface.

Tested by the sole character originally assigned it, this species could not be maintained; for its carpels are not always glabrous, while those of *P. Californicus* are sometimes nearly so. But, by the two new characters here first indicated, the long, narrow outer filaments and the obviously torulose, or almost moniliform carpels, I think it may claim the rank of a species. The habitat also would lead us to look for morphological distinctions. The principal headlands of the Pacific Coast of North America, as already noted, commonly mark the limits of seaboard species in various genera. Distinctively southern types in *Eschscholtzia*, in *Platystemon* and other genera outside of this family, appear to begin at Cape San Quentin, on Mexican territory, and find their absolute limits northward at or below Point Conception, above Santa Barbara. Between the cape last named and Point Pinos (Monterey) we have another set of seaboard species. *Eschscholtzia Californica* and *Platystemon Californicus*, the former originally from Monterey, the latter from San Francisco, are both apparently restricted to that hundred miles or more of coast-line between Point Pinos and the northern extremity of the San Francisco Peninsula; and many are the species in other genera which are unknown beyond just these limits. Other types appear first at Point Reyes above San Francisco, and are unknown beyond Cape Mendocino. Within these latter limits ranges, for example, *Eschscholtzia cucullata*, the homologue of *E. Californica*, which is limited, as I have said, to the coast between San Francisco and Monterey. These considerations must, I say, give weight to the rather few characters by which *P. leiocarpus* is recognizable. The plant is unknown on the territory of *P. Californicus*, as that is unknown much to the northward of Monterey.

The best specimens I am able to cite of *P. leiocarpus* are in U. S. Herb., from Mendocino, June, 1898, by H. E. Brown, and in Herb. Calif. Acad. from Bodega Point, on the same strip of coast, 1899, by Miss Eastwood; where there is also preserved, and by the same collector, from Point Reyes, 5 May, 1901, a specimen with rather short, few-jointed carpels, the whole fruit nodding. I scarcely need add that all these specimens are from the region whence came the original *P. leiocarpus.*

3. P. VILLOSUS. Rather slender, 6 to 10 inches high, loosely branched and leafy; leaves small, mostly but an inch long, linear, acutish, softly hirsute, not more so marginally than superficially, the peduncles not elongated, softly and rather copiously hirsute with spreading hairs: corolla an inch broad, saucer-shaped, cream-color tinged with red, deciduous: stamens exceedingly small, the cuneate-oblong rather thin and translucent filaments obtuse at summit, rather wider just below it, the extremely small oblong anthers either sessile or inserted on a very short stipe: immature carpels completely invested and concealed by a dense villous pubescence, in maturity more loosely but still strongly villous, about 5 to 7-jointed and much constricted, the joints oblong-ovoid, neither carinate nor of uneven surface; stigmas long and filiform, more than half as long as the body of the carpel.

Bodega Point, Sonoma Co., 1899, Miss Eastwood in Herb. Calif. Acad. As to habit not so very unlike *P. Californicus;* but the fine dense villous character of the pubescence of the carpels no less than the striking peculiarities of the stamens, mark this as one of the best of species.

4. P. CAPSULARIS. *P. Californicus*, Curran, Proc. Calif. Acad. 2 Ser. i, 240, not Benth. *P. Californicus*, var. *capsularis*, Brandg. Zoe, v. 177. Nearly 2 feet high, loosely branched and leafy nearly to the summit; leaves narrow-

linear, acutish, rather strongly hirsute, most so marginally; peduncles copiously and stiffly hirsute with spreading hairs: corolla an inch broad, saucer-shaped, deciduous: stamens of the outer series with short obcordate filaments: carpels 15 or 20, an inch long, siliquiform, seldom even torulose, seedless except externally, that is, within the cavity formed by union of the whole circle of carpels, rarely torulose and breaking into 1-seeded joints, almost hispidly hirsute dorsally, the carpels at length separating and becoming somewhat divergent: stigmas subulate-linear.

Bluffs along the seashore at San Simeon, southern California, Brandegee, June, 1889. A fragment in Herb. Calif. Acad. from Santa Rosa Island, Brandegee, may perhaps be the same. It is mounted on sheet n. 2753, along with what are the type specimens of *P. ornithopus*. *P. capsularis* differs from *P. Californicus* as much by the very different quantity and quality of its pubescence, as by the character of its fruit.

5. P. PETRINUS. Size and habit of *P. Californicus*, more slender, not fleshy: leaves lance-linear, tapering gradually to the summit, there ending bluntly in a broad callosity, the margins hirsute, the surface sparsely so: peduncles rather slender and somewhat strongly hirsute with spreading hairs: corollas saucer-shaped: filaments all spatulate-oblong, obtuse under the anthers: carpels about 10 to 14, shorter and much more slender than in *P. Californicus*, becoming free at summit and somewhat divergent in maturity, merely torulose, dark-brown, sparsely pilose, lightly carinate-nerved, obscurely somewhat tuberculate, the joints 6 or 7.

At San Pedro, Los Angeles Co., May, 1889, Brandegee, in Herb. Calif. Acad. Specimens nearly past flowering, well in fruit. Distinct from *P. Californicus*, by its narrow, callous-tipped foliage, very hirsute peduncles, etc., as well as small fruits. Fresh specimens, or such as are well in flower, may enable a better characterization of the stamens.

6. P. RIGIDULUS. Base of plant unknown; leafy branches rigidly erect, 2 or 3 inches high, the stout almost hispid peduncles about as long: leaves linear, acutish: corolla small, about ½ inch broad, turbinate at base, the petals with broad, short claw; filaments narrowly linear or nearly so, scarcely wider above: carpels 7 to 9, forming a short cylindrical fruit, only slightly torulose, sparsely bristly-hairy: stigmas narrowly linear, elongated.

This is known to me only from southern Utah, where it was obtained by Parry in 1874. The specimens are in Herb. Calif. Acad., mounted on sheet n. 2754, along with the very different *P. remotus.*

7. P. ACULEOLATUS. Very small but stoutish and rigid, diffuse, forming a depressed tuft about 5 inches broad, the branches glabrous, glaucous, densely leafy: leaves very small, oblong, obtuse, and together with the short straight rigid peduncles hispid with small straight ascending prickles: corolla about ¼ inch broad, rotate, white or cream color, the petals oblong-obovate: filaments narrowly spatulate linear, not much longer nor any broader than the oblong-linear anthers: carpels about 9, less than ½ inch long, very straight, not emphatically torulose, about 7-jointed, each joint armed with a short flattened ascending prickle: stigmas subulate-lanceolate, stout, erect, hirtellous.

On the small rocky islet known as Santa Barbara Island, off the coast of southern California, where it is probably endemic, and was collected by Mrs. Trask, May, 1901. A diminutive species, most distinct from all others, even the insular ones, in aspect and character.

8. P. ORNITHOPUS. Diffusely branched, dwarf, only 3 or 4 inches high, not slender: leaves oblong, obtuse, glabrous or sparingly hairy: peduncles short, nodding in fruit: corolla ½ inch broad, white or cream-color, rotate: filaments

almost linear, a little wider at summit: carpels about 9, forming an oblong fruit about 4 lines long, but at length mostly separating and widely divergent, in this phase not at all constricted, nor the joints in any way marked or roughened, pale and glaucescent, glabrous or with a few scattered hairs: stigmas very short, subulate.

Santa Rosa Island, Brandegee, 1888; a part of his *P. Californicus* var. *nutans* evidently. The only specimens seen by me are in Herb. Calif. Acad., where they occupy in part sheet n. 2753, one specimen mounted thereon being large, and very different, but imperfect and indeterminable..

9. P. SPHAEROCARPUS. P. *Californicus*, var. *sphaerocarpus.* Brandg. Zoe, v. 177. A foot high or more, leafy nearly to the summit of the decumbent branches, the peduncles little exceeding them: leaves 2 or 3 inches long, obtuse, not callous-tipped, thin, hirsute-ciliate: corollas cream-color, saucer-shaped, only ¾ inch broad, the petals scarcely unequal: stamens only slightly unequal, none of the filaments widely dilated, all spatulate-linear or linear, obtuse under the anthers: fruit less than ½ inch high and rather broader, often of depressed-globose outline; carpels about 20, tipped with extremely short lanceolate-subulate somewhat recurved stigmas, not in the least constricted, on the contrary thickest at the joints, these 4 or 5, somewhat quadrate in outline as viewed from the back, truncate at both ends and even subcubical, the sides turgidly striate.

Most singular and remarkable species, thus far collected only by Brandegee, at Colusa Junction, Colusa Co., May, 1889; the specimens in Herb. Calif. Acad. and Herb. Parish. The very short carpels are most distinctly jointed without being at all constricted, the joints each of about equal thickness from end to end, and truncate.

10. P. PURPURATUS. *P. Californicus*, Lindl. Bot. Reg. t. 1679; perhaps in part of Bentham. A foot high or more,

freely and decumbently branched, slender as compared with *P. Californicus* and strongly hirsute: leaves narrowly linear, obtuse, not callous-tipped: small round-obovoid buds villous, hardly nodding: corolla ¾ inch broad, rotate above a very short turbinate base, the inner petals much narrower and acutish as compared with the obovate outer 3, all pale yellow or cream-color at first, all but those of the very earliest flowers persistent over the mature fruit and changing to rose-red or rose-purple: stamens of the outer series with obcordate filaments, their anthers not always sessile, sometimes raised on a short stipe, those of the inner emarginate; anthers of all much shorter than in most species, elliptic-oblong to linear: carpels 16 to 20, either moniliform and with short smooth round joints, or merely torulose, the joints not well developed and the seeds in this case borne nakedly within the capsule-like cavity, the whole body of the carpel usually hirsute with finer and more spreading as well as more copious hairs than those of *P. Californicus*, or sometimes nearly or altogether glabrous.

Completely distinct from *P. Californicus* by many characters, though originally confused with it, this species has been collected by Brandegee at Monterey with cream-colored corollas, at Castroville in the same region with almost red petals. Copious specimens of his have been seen in U. S. Herb. Calif. Acad. and of Parish. I collected it myself at Monterey in 1895, but in very mature specimens, with only torulose and almost vacant carpels. At the other extreme, as to development, are the beautiful specimens collected this year and distributed by Mr. Heller. I have found no anthers quite so strongly stipitate within the obcordate notch of the filaments as they are represented in the figure cited; but the traces of that character exist in many specimens.

11. P. COMMUNIS. Loosely branched and reclining, the leafy branches often a foot long, the peduncles comparatively

short; leaves 2 or 3 inches long, linear, obtuse, thin, loosely hirsute-ciliate and with few or no superficial hairs: corollas an inch broad, cream-color, saucer-shaped: stamens very unequal, the outer half the length of the inner, their broad filaments obcordate, those of the others spatulate-linear, obtuse: carpels about 12, cohering and forming an oblong fruit an inch long including the stigmas, quite moniliform, about 10-jointed, green and glaucous except as to a not very prominent dark-colored midnerve, the sides indistinctly subcristate-rugose.

Var. STYLOSUS. Like the type as to size, flower, and general habit, but carpels few-jointed, the joints only 5 or 6, and slender stigmas greatly elongated, these and their style-like base equal in length to the seed-bearing body of the carpel.

Inhabiting the coastal hills back from the sea, throughout the region of San Francisco Bay. An excellent and typical specimen is in Herb. Calif. Acad. from San Rafael, Marin Co. by Justin P. Moore, 20 April, 1878. Others as typical are in the same collection, gathered by Miss Eastwood, one sheet from Lake Merced, San Francisco, another from Lagunitas Creek, Marin Co. An excellent sheet in U. S. Herb. bears the meager legend, "California, J. R. Vasey, 1875." This is doubtless also from near San Francisco.

The var. *stylosus* has the same range, and is represented in the U. S. Herb. by a sheet from Kellogg & Harford, obtained at School Station (a former suburb of San Francisco lying towards Lake Merced, if I remember rightly), May, 1868. It is also in my own herbarium from Sequoia Cañon, Marin Co., May, 1892, by Michener & Bioletti.

12. P. TORTUOSUS. Leafy branches a foot long or less, stout and tortuous, as are also the elongated peduncles; leaves commonly 3 or 4 inches long, obtuse, notably hairy above, not obviously ciliate: corollas 1½ inches broad,

saucer-shaped, deciduous but rather tardily so, the cuneate-obovate petals nearly equal, mostly of a deep lemon-yellow, only the margins below the middle and the very base cream-color: stamens very unequal, filaments of the obcordate outer series shorter than their anthers and of less than half the length of the narrow and merely obtuse inner ones: carpels about 20 to 24, cohering by their styles, these as long as the stigmas, the two of much more than half the length of the torulose body, the whole fruit 1 to 1¼ inches long, strongly constricted, the joints about 12, dark-colored dorsally, with scarcely a trace of any midnerve, the sides glaucous-green, irregularly wrinkled.

In sandy fields near Tracy, Contra Costa Co., Calif. 25 April, 1903, Carl. F. Baker; distributed by him under n. 2780. The species is about the largest one known; the petals almost occupied within, as it were, by a large cuneiform yellow spot, this leaving only the very base, and the lower margins whitish. The tortuous character of stems and peduncles is a peculiarity.

13. P. TESSELLATUS. Stout and low, 6 inches high or more, leafy branches very short: leaves oblong-linear, 1 or 2 inches long, obtuse, not callous-tipped, hirsute-ciliate: peduncles twice to thrice the length of the branches, rather few, stout, sparsely yet coarsely and stiffly hirsute: corollas cream-color, an inch broad, rotate above a short turbinate base, the petals being short-unguiculate: outer filaments linear-cuneiform and from strongly retuse to nearly truncate at summit, all much broader than the anthers and petaloid: fruit ovoid to oblong, ½ to ¾ inch long including the short coherent styles and linear barbellate stigmas; carpels 12 to 15, much constricted, pale and glaucous except as to a broad low dark-brown dorsal line, usually glabrous, occasionally with scattered hairs, more rarely quite notably

setose-hairy; joints 6 to 9, rather large, their sides compactly and turgidly undulate-rugose.

Hills of the Mt. Diablo Range east of Oakland, and on adjacent plains toward Antioch; the type collected by myself in what are called the Briones Hills, 17 April, 1887, specimens being extant in U. S. Herb. and in my own. Taller specimens, and these with elongated leafy branches quite as long as the peduncles, were collected at Antioch, in 1889, by Brandegee; but these in Herb. Calif. Acad. (sheet 2770) are mixed with another and very different species.

14. P. PROXIMUS. With the habit of *P. tessellatus* and about as tall, but slender, the leaves more elongated, not obviously ciliate, and the peduncles thinly and softly hirsute: petals consimilar, scarcely even short-unguiculate, the corolla therefore almost rotate: outer filaments broader and their terminal lobes rather acute: fruit narrow, cylindric or merely oblong; carpels only 9 to 12, their dorsal line more delicate, not darkened, the whole fruit pale and glaucous; joints 7 or 8 or even fewer, less emphatically rugose on the sides and the rugæ not undulate.

Represented in U. S. Herb. by two sheets, both from near Chico, Butte Co., one by Mrs. R. M. Austin, April, 1896, the other by H. E. Brown, April, 1897. In Herb. Calif. Acad. is an imperfect small specimen from Madison, Yolo Co., by Blankinship which perhaps also belongs here.

15. P. EMARGINATUS. Stoutish, decumbent or reclining, the leafy branches ½ to 1 foot long, the peduncles not as long, with foliage and peduncles sparsely and shortly hirsute: leaves 2 inches long, obtuse or acutish, without callosity: corollas, saucer-shaped, cream-color, 1 to 1¼ inches broad,

outer petals obovate, inner much narrower, elliptical, all deciduous: stamens not very unequal, all with rather broad filaments, at least the outer series emarginate, the anthers sessile in a notch formed by the acutely triangular lobes: fruit subcylindric, glabrous, about an inch long including the stigmas, carpels about 14 to 18, narrow, constricted, pale and glaucous, traversed by a strong obtuse midnerve, the 7 to 9 joints turgidly though rather minutely subcristate-rugose on the sides.

Foothills near Stanford University, Santa Clara Co., 24 April, 1902, C. F. Baker; distributed under n. 665. Mr. Baker's n. 433, from Crystal Springs Lake in the same region, seems in part to represent this, while other specimens under the same label appear to be *P. communis;* and the like is true of Heller & Brown's n. 5105 from near Windsor, Sonoma Co. The two species must needs be held distinct if only on the ground of the great differences in the character of the filaments. Both are evidently peculiar to the region of San Francisco Bay.

16. P. QUERCETORUM. A foot high or less, rather slender, decumbent, much branched, only sparsely pilose as to the narrow-linear obtuse leaves, the peduncles more conspicuously so; these not longer than the leafy branches: corollas cream-color, an inch broad, the petals tapering to a very distinct though not narrow claw, and the whole corolla somewhat turbinate, persistent, with the stamens except as to the earliest flowers: filaments of the outer series not much, if any, longer than the long, narrow, linear anthers, of oblong-obovate outline but sharply notched at summit, the acute lobes short: oblong fruit $\frac{3}{4}$ inch long, including the long filiform stigmas; carpels about 12, rather slender, a delicate green nerve traversing the whole dorsal length, but each of the 6 or 7 joints with an elliptic dark spot on the back, the sides more

or less distinctly wrinkled, either naked or with a few bristly hairs.

Oakland, 23 March, 1889, V. K. Chesnut in U. S. Herb.

17. P. ARVORUM. Rather loosely diffuse, a foot high, more or less, and slender, the leafy branches and their many peduncles of about equal height: leaves narrow, 1½ to 3 inches long, acutish and callous-tipped, only scantily and softly pilose, the peduncles more hirsute: corollas 1 inch broad, quite rotate, the petals obovate, the inner distinctly narrower, all yellow at tip, the yellow extending cuneately down to the base of the petal, leaving the broad margins of cream-color below the middle, deciduous: stamens very unequal, the outer and shorter oblong-cuneiform, the anther sessile in a deep notch between acute lobes, the inner spatulate-linear, truncate under the anthers; fruits small, only ½ inch long, including the rather long filiform stigmas and short styles; carpels about 12, abruptly and deeply constricted, about 6-jointed, without midnerve and the pericarp pale, glaucous, thin, marked with thin wavy striæ, or these obscure.

In sandy fields at Tracy, San Joaquin Co., 25 April, 1903, Carl F. Baker, who distributed it under n. 3199. Easily distinguished from all others by its corolla and carpels.

18. P. NIGRICANS. About a foot high, the suberect leafy branches and the surmounting peduncles of about equal length: leaves thin, pale, 2 inches long, commonly with a hollow cupuliform callosity at tip, sparsely hairy above, remotely so on the margin, the hairs all slender: corolla barely an inch broad, saucer-shaped, cream-color, deciduous: stamens unequal, apparently all elongated and with filaments only moderately dilated above the middle, below linear-filiform: carpels about twenty, forming an ovoid fruit

little more than $\frac{1}{2}$ inch long the stigmas included, obviously constricted, the 4 or 5 joints not small, dark brownish or blackish, without obvious midrib but marked by turgid and and close parallel ridges; stout styles and slender-subulate stigmas each about a line long.

Known only as collected by myself in the hill-country east of Livermore, Alameda Co., 3 May, 1895, the exact locality near the railway station called Midway. The specimens were nearly past flowering, and well in mature fruit; the joints recalling the nutlets of the common *Tropæolum.*

19. P. CONTORTUS. A foot high, stoutish, short-stemmed, very long-peduncled; pubescence of foliage short, sparse, not obvious, that of the peduncles as little conspicuous, short, scattered, somewhat deflexed: flowers not known: carpels 12, large, $1\frac{1}{2}$ inches long, dark-colored, glaucous, much compressed, the joints few and remote, the whole fruit spirally twisted together; the few seminiferous joints rather elongated, strongly and turgidly rugose; stigmas subulate, flat, ciliolate.

A large species with remarkable fruit. It is known but in a single imperfect specimen purporting to have been obtained somewhere in Lake Co. or Colusa, by Mrs. Curran, in 1884, and is preserved in Herb. Calif. Acad.

20. P. CRENATUS. Size of the last, equally stout and conspicuously long-peduncled; foliage and its hairiness similiar, but that of the peduncles spreading, not deflexed: flowers unknown: carpels 14, in maturity little less than 1 inch long including the short linear obtuse stigma, glabrous, glaucous, constricted but not laterally, the about 8 joints marked by abrupt deep dorsal sinuses, their sides indistinctly corky-rugose.

Also known in a single specimen collected at the same time and place with the last, and seen in Herb. Calif. Acad.

21. P. COMMIXTUS. More slender than the two foregoing, the pubescence copious, soft, spreading: corolla 1 inch broad, the cuneate-obovate petals apparently yellow: filaments not very unequal, spatulate-oblong, the outer obcordate under the anther: carpels 12, at first concealed by a dense coat of appressed coarse-villous or hirsute hairs, in maturity little more than an inch long including the long and slender stigmas, rather strongly hirsute with ascending hairs: joints about 7, somewhat turgid, obtusely carinate and rugulose-roughened.

This, together with the last two, were pressed together in a bunch, and fastened down as one specimen, on sheet n. 2755 of Herb. Calif. Acad. All were collected in Lake Co., or perhaps Colusa Co., and in the same vicinity doubtless. Perceiving in the bunch three specimens of as many distinct species, I separated them, leaving *P. contortus* on the original sheet.

22. P. CONFINIS. Short leafy branches stoutish, decumbent: leaves 2 inches long, oblong-linear, obtuse: scapiform peduncles stout, erect, 8 to 10 inches high, rather softly hirsute with spreading hairs: corolla rotate, about 1 inch broad, cream-color, the petals broadly obovate: stamens very many, extremely unequal, the outermost series of less than a fourth the length of the innermost, their broad filaments not longer than the anthers, these in all nearly oblong and short for the genus: fruit cylindric, naked, the petals and stamens being deciduous, carpels 9 to 12, merely torulose, loosely villous-hirsute: stigmas uncommonly thick and short for the genus, lanceolate, densely pubescent.

Known only in a single specimen sent to the U. S. Herb. by J. W. Toumey, from the Bradshaw Mountains, Arizona, 17 June, 1892.

23. P. MOHAVENSIS. A foot high, the short decumbent leafy

branches greatly surpassed by the stout striate bristly-hairy scapiform peduncles: leaves much less hairy, 2 inches long, acutish, but with a prominent blunt callosity: buds spherical: corolla 1 to 1½ inches broad, cream-color, the petals short-unguiculate: outermost series of filaments short, thrice the breadth of their anthers and sharply notched, all the others narrower and merely obtuse, the innermost almost filiform, not wider at the widened summit than the anther itself: fruit an inch long, the bristly-hairy carpels very regularly torulose, the joints limited by shallow constrictions and marked by delicate lines and rather ill-defined intervening tuberculations.

Collected by Marcus Jones, 24 May, 1884, at Hackberry, Mohave Co., northeastern Arizona, a little to the eastward of the Mohave Desert; the specimens preserved in U. S. Herb.

24. P. ANEMONOIDES. Leafy branches short, the peduncles twice as long, therefore subscapiform, the whole 10 inches high, stoutish: the linear obtusish slightly callous-tipped leaves hirsute chiefly along the margin, the peduncles more so: corolla cream-color, an inch broad, the petals equal and consimilar, narrow, mostly spatulate-oblong and either rotate-spreading or somewhat deflexed: stamens very many and unequal, the outer but half as long as the inner, the filaments of all spatulate-linear, with some hints of rounded lobes at summit and in so far emarginate; anthers long, linear, the outer of equal length with their filaments: carpels 18 or 20, long and slender, the filiform stigmas and short styles together almost as long as the body, this scarcely more than torulose, dark-colored, 10-jointed, rather indefinitely low-rugose, and hirsute with stiffish ascending hairs.

In Herb. Calif. Acad., from Acalde, Fresno Co., 9 May, 1892, Miss Eastwood; also apparently one fragment by Brandegee, on sheet n. 2800, from Huron, in the same county, in the

same year; this fragment being mounted along with the type of the very different *P. leptander*.

25. E. ELEGANS. More slender than the last, also more nearly acaulescent, the narrow leaves acutish and more distinctly callous at tip; the narrow petals somewhat broader and inclining to be obovate and with a more distinct claw, the corolla in expansion only rotate above a short but distinct turbinate base: stamens not only not numerous but uncommonly few, and short, scarcely reaching to the base of the stigmas, and with merely oblong anthers short in proportion; no filaments broader than spatulate-linear and little wider at the obtuse or retuse summit than the anther; carpels more nearly moniliform, with shorter more finely wrinkled joints, and glabrous.

San Emidio, Kern Co., 26 March, 1893, and perhaps the same at Panorama Heights, Bakersfield, in the same county, the same year, both by Miss Eastwood.

26. P. HORRIDULUS. Slender, 5 to 8 inches high, crinite-hirsute both as to short leafy branches and foliage and long scapiform peduncles: corollas yellow, 1 inch broad, but the petals spreading only from below the middle, their long claws forming a turbinate base to the corolla: filaments narrowly linear, slightly wider toward the summit, yet not as wide as the anthers: carpels about 16, in maturity $\frac{3}{4}$ inch long including the short style, and long linear hirtellous stigmas, the whole seminiferous portion crinite-hirsute with spreading hairs and strongly constricted, the joints about 6, rounded on the back and of oval outline, marked with several prominent straight rather turgid ridges.

This species, remarkable on account of its densely long-hairy carpels, was obtained in Fresno Co., somewhere between Sequoia and Sanger Mills, May, 1894, by Miss Eastwood; the type specimens in Herb. Calif. Acad.

27. P. CRINITUS, Greene, Pitt. ii. 13. Stout and subacaulescent, the leafy stems very short but the whole plant 6 to 10 inches high, densely crinite-hirsute with soft hairs 3 or 4 lines long: buds globose, but appearing like a ball of soft silky hair: corolla an inch broad, rotate, the mass of stamens very thick and dense, the outer much shorter than the others, as well as broader, the anther sessile in a rather sharp notch between two manifest acute or at least acutish teeth, the inner filaments much narrower, usually only sharply truncate: carpels about 16, short, the seminiferous part completely invested by the persistent petals and stamens, strongly constricted, about 6-jointed, very fragile, the ovoid joints with thin pale pericarp traversed by a delicate midnerve and a few more accentuated yet not perfectly continuous wrinkles.

This excellent species, now that the real characters of species in the genus have been investigated, is found to have strong marks that were neither adverted to nor even seen at the first. Though described originally from material of my own collecting near Thachapi, it seems to have been gathered earlier in the same year, though badly preserved, by either Mr. or Mrs. Brandegee, somewhere in the same region. If I am right in referring them to this species, some specimens collected by Mr. Parish at Cajon Pass in San Bernardino Co. in May, 1882, are the oldest extant in the herbaria. These though strongly hirsute are less so than the others, but, as they were taken when in full flower, and while the filaments were at their best, their sharply notched character is more manifest than in the old and withered originals. Coville & Funstons' n. 1193 of the Death Valley Expedition, in so far as I have seen the material, is to be referred here; though in the Calif. Acad. sheet the carpels are delicately and sparsely pilose, while in that in U. S. Herb. all are glabrous, and some effete and not even torulose. The outer

filaments are more deeply and sharply notched in these Tejon Mountain specimens than in any of the originals; and I have some misgiving lest as here presented the species may prove an aggregate.

28. P. Hyacinthinus. Crinite-hirsute, though less so than *P. crinitus*, the plant comparatively low, slender, more nearly acaulescent, the scapiform peduncles only 3 or 4 inches high: leaves only an inch long, with an apical callosity, but this obscured by the dense pubescence: corollas less than an inch broad, white or cream-color; petals cuneate-obovate, equalled by the very many stamens; filaments of the outer series not much shorter than the others but slightly obcordate, the others more narrowly spatulate-oblong and merely obtuse, all the anthers uncommonly short, merely elliptical and only subsessile, the short but distinct suggestion of a stipe being present in all: ovaries glabrous, not known in maturity.

Only a single specimen seen, that in U. S. Herb. from H. M. Hall, gathered in a meadow at 4500 feet altitude on San Jacinto Mountain, 19 May, 1897; distributed for *P. crinitus*, but very distinct; its stamens altogether peculiar.

29. P. Antoninus. A foot high or more, the ascending leafy branches and firm upright peduncles of about equal length, the habit rather strict: small linear obtuse leaves and stoutish peduncles only lightly hirsute: flowers very small for the plant, little more than ½ inch broad; petals narrowly obovate, pale cream-color within and also at the base outside, otherwise of a deep rose-purple: filaments very unequal, otherwise all alike, spatulate-linear, retuse under the linear anthers, and with the petals closely investing the mature fruit: carpels 12 to 15, barely ½ inch long including the short lance-linear stigmas, the joints about 6, obviously and even rather strongly turgid-wrinkled.

On the San Antonio River in the Santa Lucia Mountains, May, 1897, Miss Eastwood, in Herb. Calif. Acad. A large plant, with small flowers mainly red.

30. P. Mendocinus. A foot high, slender but rather rigid both as to the short leafy decumbent branches and thrice longer scapiform peduncles: leaves rather narrowly linear, 1½ or 2 inches long, distinctly callous-tipped, only sparsely and obscurely hairy with short white hairs, those of the peduncles scarcely more elongated and obvious: corolla cream-color, but each petal tipped with yellow, all of oblong-obovate outline, the 3 inner distinctly unguiculate and the whole corolla slightly turbinate at base: filaments extremely unequal, the outer and shorter sharply though not deeply notched, the inner nearly truncate under the long linear anthers: carpels about 9 or 10, short, their short styles and very long filiform stigmas together longer than the body, this much constricted, about 5-jointed, light-green and glaucous in full maturity and invested by the dry corolla and stamens, the joints with a distinct though not heavy midrib and a few ill-defined lateral ridges, these more or less connected by smaller transverse wrinkles.

Cahto, Mendocino Co., May, 1902, Miss Eastwood, in Herb. Calif. Acad.

31. P. heterander. Subacaulescent, 6 to 10 inches high: leaves narrowly linear, erect, 2 inches long, callous-tipped, and softly hirsute as are also the long scapiform peduncles: carolla saucer-shaped, less than an inch broad, white and yellow: stamens in each flower very diverse, the outer and shorter with cuneate-obovate to oblanceolate lacerate-toothed or entire filaments which, under the anther, taper to a longer or shorter point, or this taper-point obsolete and the anther sessile on a merely acute terminus of the

filament, those of the inner narrow throughout and toothed or entire: carpels 10 or 12, much constricted, 5 or 6-jointed, the turgid joints subcristate-rugose.

Seen only in Herb. Calif. Acad., and from the collection of Mrs. C. C. Bruce, the locality the foothills of the Sierra Nevada in, I think, Butte Co. The sheet is n. 2783, and contains four specimens of *P. heterander* besides one of *P. proximus.*

32. P. GLYPTOLOBUS. About 10 inches high, rather slender, the short leafy branches decumbent, the peduncles twice or thrice as long and scapiform: leaves linear, 1½ inches long, slightly callous at tip, villous-hirsute with somewhat appressed white hairs; peduncles only sparingly clothed with like short soft white but spreading hairs: buds round-obovate, apparently always erect; corolla ¾ inch broad, saucer-shaped, the outer petals obovate, the inner as long but much narrower, all cream-color tipped with an orange-yellow spot, and with a similar but smaller spot at base: filaments not very unequal nor much longer than the long linear anthers, all emarginate at summit: carpels 9 to 12, rather slender, much constricted, traversed dorsally by a very strong obtuse keel, 5 to 8-jointed, the sides strongly, interruptedly and somewhat sinuately cristate-rugose.

A handsome species obtained by Mr. Carl F. Baker, on stony hills near Lakeport, 9 May, 1903, and distributed by him under n. 3058.

33. P. EXSCULPTUS. Slender, short-stemmed, long-peduncled, 6 to 10 inches high: leaves linear, 2 inches long, somewhat callous at tip, softly hirsute, as are also the peduncles: corolla cream-color, ¾ inch broad, the rather narrow and acutish petals short-unguiculate and the base of the corolla somewhat turbinate: stamens very unequal, the outer fila-

ments short, mostly truncate under the anther, the inner narrower, some of them even lance-linear and attenuate under the anthers; both petals and stamens persistent over the mature fruit: carpels 6 to 12, much constricted, only obscurely carinate dorsally, 5 or 6-jointed, the turgid joints curiously subcristate-sculptured in the middle of each side and with or without traces of lateral ridges running from the cristate protuberances.

This excellent species, the superficies of whose carpels is so peculiar, yet so difficult to describe, was first detected on sheet 2770 of the Herb. Calif. Acad. where a small specimen is glued down along with several of the very different *P. tessellatus*, all purporting to have been gathered at Antioch, April, 1889, by Brandegee. But in U. S. Herb. exists a sheet, under the same label, which is *P. exsculptus* without admixture.

34. P. RUGOSUS. Subacaulescent, the short branches densely leafy, the many peduncles twice or thrice as long, the whole 5 to 10 inches high and densely hirsute with brown hairs: corolla an inch broad, slightly turbinate at base: stamens rather few; filaments of the outer oblong-spatulate, of the inner spatulate-linear, obtuse to nearly truncate under the long linear anthers, and with the petals persistent over the mature carpels; these 7 to 9, about 4 or 5-jointed and rather coarse, dark-brown, traversed dorsally by a very prominent obtuse keel-like midrib, and on the sides by quite uninterrupted and very prominent turgid ridges without other marking: stigmas very short, not as long as the style-like vacant termini of the carpels and subulate-linear.

Pilot Ridge, Eldorado Co., in the foothills of the Sierra Nevada, Miss Eastwood; the year not indicated. The specimens are labelled *P. crinitus* in Herb. Calif. Acad. by Miss

Eastwood; and the plant may be considered as a northern homologue of that southern species, though its carpels are of a most different character from those of that or any other known member of the genus.

35. P. PECTINATUS. Stout, a foot high, the robust subscapiform peduncles making more than half that height, the decumbent branches rather loosely leafy and the leaves small, 2 inches long, linear, apparently callous-tipped, hirsute above, and marginally, glabrous beneath: peduncles very hirsute: corollas an inch broad, saucer-shaped: stamens moderately unequal, all with long spatulate-linear very obtuse or even slightly obcordate filaments, these and the petals persistent: carpels 20 or more, an inch long including the uncommonly long filiform stigmas, not constricted, yet breaking into 8 or 9 truncate joints, the dorsal ridge beset with about two series of whitish prickles each terminating in from 1 to 3 long hairs, the carpel thus appearing subserrate-pectinate and strongly hirsute dorsally; the sides rather amorphous-sculptured, the whole dark-brown in color.

A very remarkable species in the character of its carpels; known only as in Herb. Calif. Acad. of Miss Eastwood's collecting at Alcalde, Fresno Co., 9 May, 1893.

36. P. SUBEREUS. Stout and rigid, 8 to 10 inches high, branched and leafy at base only, the scapiform peduncles sparsely hirsute with long spreading hairs: corolla an inch broad, apparently yellow, saucer-shaped: filaments of the outer series of stamens narrow-cuneiform, mostly tridentate at the broad summit, the middle tooth longest, sometimes slenderly attenuate, this bearing the anther, the innermost not tridentate and the anther often quite sessile: carpels about 10, stout, scarcely torulose, turgid, 6-jointed, glabrous,

of a dark smoky brown, the back and sides singularly amorphous-roughed, resembling strips of cork; the fruit, as in allied species, covered by the persistent petals and stamens.

Known only from some unrecorded station in Colusa Co., where it purports to have been collected in 1889, by Brandegee; the specimens seen in Herb. Calif. Acad.

37. P. PILOSELLUS. Slender, a foot high or less, densely pilose-hairy, the peduncles scarcely exceeding in length the leafy branches, and less hirsute than the narrow leaves: buds narrowly obovoid: corolla apparently deep-yellow, $\frac{3}{4}$ inch broad and with short turbinate base, the petals being narrowed to a short but distinct ligulate claw: filaments narrowly linear, retuse under the anthers but hardly equaling them in breadth: fruit only $\frac{1}{2}$ inch long, the carpels about 10, slender and strongly moniliform by the abrupt deep constrictions between the 7 to 9 rounded joints, the whole series traversed dorsally by a strong obtuse midnerve or keel, the joints with little or no uneveness of surface.

Madera, Madera Co., May, 1889, P. S. Buckminster, in Herb-Calif. Acad. The only species, I believe, in which the hairiness of the foliage is more dense than that of the peduncles; and it is a coarser hairiness than that of the considerable group typified in *P. crinitus.*

38. P. PENICILLATUS. Low, slender, subacaulesant, the whole plant about 5 inches high; leaves an inch long, obtuse, callous-tipped, not very hairy; scapiform peduncles very hirsute: corolla small, the petals all distinctly though shortly unguiculate: filaments very narrow, spatulate-linear, widest at the obtuse or emarginate summit and little or not at all wider than the short merely linear-oblong anthers: fruit about $\frac{3}{4}$ inch long including the stigmas, but these as long,

or even longer than the body of the carpels, these about 16, abruptly and deeply constricted, about 6-jointed, the joints loosely and not very distinctly wrinkled, all but the tuft of long slender stigmas enclosed by the persistent petals and stamens, or these in the earliest flowers deciduous.

This rests on a single sheet of four specimens in Herb. Calif. Acad., labelled in the handwriting of Miss Eastwood *P. Californicus*, but the locality "Santa Maria Mountains" in another hand. The large tuft of long stigmas, protruding brush-like from amid the corollas that enclose the rest of the fruit, gives the plants a singular appearance.

39. P. OBTECTUS. Much branched, nearly upright or decumbent; leafy branches 5 to 7 inches high, the villous-hirsute peduncles surpassing them by as much or more: leaves linear, acutish, callous-tipped: buds obovate, and, with the young peduncles under them, crinite-hirsute: corolla an inch broad, cream-color, saucer-shaped, the outer petals obovate, the inner elliptical: stamens unequal, not dissimilar, the filaments oblong-linear to narrowly spatulate-linear, widest and retuse under the linear anthers: carpels, 15 to 18, short-jointed and moniliform, the joints about 9, the pale thin pericarp delicately lineolate, the median line only more pronounced and continuous than the lateral ones, the whole, except the styles, invested in maturity by the persistent petals and stamens.

Var. SANCTARUM. Not as tall as the type. More acaulescent and compact, the short densely leafy stems only 2 or 3 inches high, the peduncles stouter and as long: leaves oblong-linear, obtuse or somewhat retuse by a depressed callosity; pubescence more appressed, and that of the peduncles less copious: corollas $\frac{3}{4}$ inch broad, the petals often tipped with red: carpels shorter, with fewer joints, these some-

times as in the type, sometimes inclining to be wrinkled rather than lineolate.

Species apparently common from the southern borders of San Diego Co., to southern Montery Co., if the variety is really not a proper species. The type is from Witch Creek, San Diego Co., 24 May, 1894, and is in my own herbarium. There is a similar plant, quite typical, in U. S. Herb. from Santa Ysabel, also in San Diego Co., by H. W. Henshaw, 25 Apr., 1893. Nearly like these is a sheet in Herb. Calif. Acad. by Miss Eastwood from somewhere near the boundary line between Santa Barbara and San Luis Obispo counties, 6 May, 1896.

The var. *sanctarum* I find represented only in Herb. Calif. Acad.; two sheets, from the Santa Lucia Mountains by Miss Eastwood, in 1897, and one purporting to have been sent from Santa Barbara in 1901, by Elwood Cooper. This form is so unlike the type in habit, that I should willingly have assigned it the rank of a species were not the stamens and carpels so almost exactly those of typical *P. obtectus.*

40. P. ACUTATUS. Stoutish, a foot high or less, only moderately pilose or hirsute, branched at base only and the leaves short: corollas cream-colored, very large, at least 1½ inches broad in expansion but with turbinate base, the petals not notably unequal as to breadth and all obovate above a cuneate claw-like base: stamens excessively many and unequal, the filaments of all linear-dilated and petaloid but acute under the comparatively broad and short anther: carpels about 16 or 18, not known in maturity.

The best specimen seen of this new species, which is unique in the genus by its uniformly acute filaments, has been distributed by C. A. Purpus, from the Middle Tule River, southern California, being a part of his n. 5006

as in the U. S. Herb., there being mounted on the same sheet, and under the same label, a specimen of what seems to be *P. turbinatus;* though it is immature, and its identity not quite clear. There is also a poor specimen of the same, by the same collector, under his label 5500, in U. S. Herb., from Erskine Creek, the better specimen on this sheet being perhaps *P. crinitus;* but it is doubtful.

41. P. TURBINATUS. More than a foot high, loosely and sparingly branched, but the scapiform peduncles far exceeding the branches: leaves 2 or 3 inches long, linear, obtuse, slightly callous at tip, moderately hirsute, but the hairs short, those of the peduncles longer and spreading: corolla cream-color, nearly 1½ inches broad in expansion above a pronouncedly turbinate base, the 3 inner petals with long and slender claw, the outer with claws as long but broader: filaments unequal but all spatulate-linear, obtuse: fruit naked, small for so large a plant, only ½ inch long exclusive of the rather short but slender filiform stigmas; carpels 24 to 28, very pale and glaucous, with about 10 abrupt deep constrictions and as many small round-bead-like joints, the whole traversed by a filiform midnerve and a few faint-striæ, otherwise smooth.

The type specimens of this fine species have been lying in my herbarium since 1886, and were communicated in that year, from near Visalia, by Dr. T. J. Patterson, of Visalia.

42. P. LEUCANTHUS. Rather slender, 10 inches high, the upright or decumbent leafy branches rather shorter than the very erect peduncles; herbage moderately hirsute; leaves short, lance-linear, only obscurely callous at tip: corolla rotate, an inch broad, apparently clear white, the petals consimilar: filaments of the very many stamens not petaloid, very narrowly and somewhat spatulately linear,

almost hyaline, not broader at summit than the anther, but often with a pair of short erect subulate teeth standing almost parallel to the base of the anther: fruit erect, oblong, $\frac{3}{4}$ inch long including the styles and slender-subulate stigmas; carpels 18 or 20, glabrous or with here and there a bristly hair, moderately constricted, 7 to 9-jointed, the joints not nerved or lineolate, but obscurely somewhat tuberculately uneven.

A beautiful species, manifestly allied to *P. verecundus* by habit and lance-linear foliage, and its fruits are rather similar, though not nodding; but the stamens are very peculiar and characteristic. Nor do I know any other species with white corollas. The only specimen, a fine one, is in my own herbarium, forming part of a purchase made from Mr. S. B. Parish ten years since. It is from the foothills of the San Bernardino Mountains.

43. P. MICROLOBUS. Slender, sparingly pilose, 10 inches high, the peduncles rather longer than the leafy branches: leaves linear, pale, thin, 3-nerved, 2 or 3 inches long, usually abruptly acutish and indistinctly or else not at all callous-tipped: corolla an inch broad, saucer-shaped, cream-color tinged with red, deciduous: stamens not very unequal, none of the filaments broader than linear-spatulate: fruit short-cylindric, less than $\frac{1}{2}$ inch long including the short linear stigmas; carpels 12 to 16, small and short-jointed, glaucous and almost white in maturity, thin-walled, the 7 to 9 joints with a delicate line on the back, the sides with a few thin wrinkles or none.

Arroyo Grande, San Luis Obispo Co., March, 1895, collected by my former pupil Miss Alice King; also apparently the same from Ojai, Ventura Co., 18 March, 1895, in Herb. Calif. Acad., by F. W. Hubby; yet this last has narrower and somewhat spatulate-linear foliage, the like of which I have not otherwise observed in the genus. It may eventually be proven distinct.

44. P. Arizonicus. Slender, commonly subacaulescent, 4 to 10 inches high: leaves narrowly linear, tapering to the callous tip, almost or altogether glabrous except as to the loosely pilose margin: scapiform peduncles slender, loosely but rather strongly hirsute; corolla cream-color, $\frac{3}{4}$ inch broad, saucer-shaped, the petals cuneate-obovate, nearly alike: stamens very unequal, but all alike as to the very narrow almost linear obtuse or truncate filaments: carpels 7 to 14, slender, with 7 to 9 small usually rounded joints, delicately lineolate, the lines sometimes anastomosing and the joints reticulate, also minutely tuberculate in some; stigmas almost filiform.

Southern Arizona only; in the Santa Catalina mountains, and also apparently the same on the plains about Tucson; collected and distributed chiefly by C. G. Pringle and J. W. Toumey.

45. P. remotus. Stoutish, bristly-hairy, about 6 inches high, subacaulescent, the peduncles much longer than the leafy branches: corolla $\frac{3}{4}$ inch broad, saucer-shaped, deciduous: stamens with very narrow spatulate-linear filaments not broader at summit than the anthers: carpels about 10, forming a middle-sized cylindric fruit, glabrous, very glaucous, strongly moniliform, the rounded joints about 9, obscurely lineolate-striate, and on the sides between the lines as obscurely tuberculate: stigmas short, barely a line long.

Known to me only as accompanying the specimens of *P. rigidulus* on sheet n. 2754 of Herb. Calif. Acad., presented by Dr. C. C. Parry, from his collection made in southern Utah in 1874.

46. P. leptander. Subacaulescent, 10 inches high, the scapiform peduncles of medium thickness, notably hirsute with spreading hairs, or some slightly deflexed: leaves 2

or 3 inches long, narrowly linear, acutish, callous-tipped, only very sparsely hairy and the hairs short: corolla cream-color, fully an inch broad, exactly rotate, all the petals rather narrowly obovate, or the 3 inner more nearly elliptical: stamens very many and much elongated, the anthers borne out beyond the stigmas; filaments of the outer series linear-cuneiform, deeply notched, the anthers sessile in the notch, the prominent lobes almost erect, only acutish, inner filaments much longer, very narrow, retuse under their anthers, all the latter elongated and narrow linear: carpels 16 or 18, short, moniliform, 7-jointed, glabrous, nearly smooth and even.

Huron, Fresno Co., 24 March, 1893, T. S. Brandegee, the single but very good specimen seen being mounted on sheet n. 2800, Herb. Calif. Acad., along with a fragment of what I take to be *P. anemonoides*.

47. P. AUSTRALIS. Small and subacaulescent, the leaves linear, but not very narrow, 1-nerved, often subfalcate, callous-tipped, very hirsute marginally with appressed rather than ciliate hairs: scapiform peduncles very slender, only sparsely hairy but the hairs long and soft: buds elongated-obovate; corolla ¾ inch broad, slightly turbinate at base, the obovate and elliptic-obovate petals all acutish, and also narrowed to a short but slender claw: filaments almost exactly linear, the outer ones sharply truncate under the anthers, the inner fully equalling the petals and all deciduous, the immature carpels 7 to 10, rather strongly hirsute, not known in maturity.

This is the most southerly member of the genus, as far as known, the rather immature specimens having been gathered at San Quentin Bay, Mexico (Territory of lower California) by Dr. Edw. Palmer in 1889, and distributed from U. S. Herb., under Palmer's n. 600.

48. P. VERECUNDUS. Slender, sparsely pilose, much

branched, upright or decumbent, a foot high, the leafy branches and the peduncles of about equal length, the latter abruptly recurved or deflexed in fruit: leaves somewhat lance-linear, 1-nerved or with faint lateral nerves below the middle, pilose-ciliate toward the base, callous-tipped: corollas cream-color, rotate, $\frac{1}{2}$ to $\frac{3}{4}$ inch broad, all the petals broadly obovate, the 3 outer broadest: filaments all spatulate-linear, broadest and merely obtuse at summit, the anthers not very long: fruit narrow cylindrical, $\frac{3}{4}$ inch long including the short styles and subulate stigmas; carpels often very few, 7 to 15, strongly constricted and moniliform, the small joints often 10 or 12, usually hirsute, marked by a distinct dorsal nerve and less obvious lateral ones, and minutely tuberculate.

Common species of the uplands about San Diego, the type specimens of my own collecting at San Diego, 7 April, 1885, and preserved in my own collection, as well as in Herb. Calif. Acad., and U. S. Herb. It occurs as far inland as San Bernardino, whence Mr. Parish has frequently distributed it.

49. P. NUTANS. *P. Californicus*, var. *nutans*, Brandg. Zoe, v. 177, in part. Near the last, not as tall, almost diffuse, the peduncles shorter than the leafy branches: leaves only $\frac{3}{4}$ inch long, linear or oblong-linear, obtuse, obscurely if at all callous at tip, the pubescence obscure, of short stiff spreading hairs, the short peduncles almost hispidulous: flowers not seen: carpels slender, about 9 to 12, glabrous or nearly so, delicately jointed but not constricted, separating and becoming divergent in maturity, the surface without obvious lineation or tuberculation.

This is based on a plant which, in so far as I know, has been gathered and distributed only by Brandegee, and from along the seashore, I think, in the vicinity of San Diego. It forms but a small part of his lately and very briefly indi-

cated var. *nutans*, which would include all the several species, whether of the mainland or of the outlying islands, which happen to have a nodding fruit; the abundant specific characters of the several members of the group being of course ignored; even the specimens probably never collated or compared. *P. nutans* is very near its upland neighbor, *P. verecundus*, and if I hold them distinct, it is more on account of the differences of habit, foliage and pubescence than of those of the merely torulose and ultimately separated carpels; for in this particular they are somewhat confluent. But between the several insular species and *P. nutans* there is no such intimate relation.

50. P. HISPIDULUS. Only 3 inches high, diffuse and leafy; peduncles not longer than the leafy branches, nodding in fruit: leaves less than an inch long, remotely hispid-ciliate, usually otherwise glabrous: peduncles sparsely setose-hispid, but sepals of the obovate bud short-prickly: corolla about ½ inch broad, apparently white, petals cuneate-obovate: filaments spatulate-linear, obtuse: carpels only 6 or 7, about 4 lines long in maturity, 4 or 5 jointed with short deep constrictions, the joints smooth, each with 1 or 2 ascending aculeæ; styles nearly obsolete; stigmas short, linear.

San Nicolas Island, remotest of the coast islands of California, April, 1897, Mrs. Trask. The plant is said to abound there, on sandy flats near the sea.

51. P. CERNUUS. Decumbent, much branched and leafy, 3 to 8 inches high, the branches stout, but the comparatively short peduncles slender, these and the linear obtuse leaves loosely hirsute: corolla white or cream-color, ¾ inch broad, rotate, deciduous: filaments linear, tapering to a filiform base: carpels 14 to 16, in maturity only ½ inch long, more or less strongly villous-hirsute above the middle, more apt to be

glabrous toward the base, short-jointed and moniliform, the joints 6 or 7, scarcely turgid, rounded and delicately rugulose-striate: stigmas short, subulate-linear, notably hirtellous.

Apparently endemic on Santa Catalina Island, whence it has been distributed to several herbaria by Mrs. Trask.

52. P. SETOSUS. Compactly branched and depressed, single plants 5 to 8 inches broad, hardly as high, very leafy; branches not slender, glabrous, glaucous: leaves linear-oblong, 1 inch long or more, obtuse, appearing as if remotely serrate by the enlarged bases of a few short stiff marginal hairs, the upper face with similar scattered setose hairs: peduncles short, stoutish, setose-hispid, nodding in fruit: corolla ½ inch broad, cream-color, rotate, the outer petals obovate-oblong, the inner elliptical, all thin, venulose: filaments narrowly linear, rather hyaline than petaloid, narrower at the obtuse at summit than the long linear anthers: fruits oval, hardly ½ inch long, the 10 or 12 carpels moniliform, the 5 or 6 short joints marked with delicate nerves and a low rather obscure intervening tuberculation; stigmas filiform, radiating.

Santa Barbara Island, May, 1902, Mrs. Trask.

THREE NEW RANUNCULI.

R. CARICETORUM. Stout perennial, at early flowering almost upright and often 2 feet high; later reclining, rooting at the upper nodes; commonly very hirsute, at least as to petioles and lower part of stem, otherwise sparingly hirsute-pubescent: lowest leaves long-petioled, either completely biternate or the 3 leaflets deeply cleft into 3 cuneate-obovate incised lobes, the whole leaf of a somewhat deltoid outline, the largest 5 or 6 inches long and quite as broad: flowers few, large, the corolla more than an inch broad, the

5 petals round-obovate: achenes with stout beak nearly as long as the body and slightly incurved, forming a subglobose head.

A fine large buttercup of the region of the Great Lakes, from perhaps Ontario to Iowa and Minnesota, inhabiting only wet meadow lands, growing among tussocks of Carex, *Caltha palustris* often one of its near neighbors or associates. It flowers in about the middle of May, and never very copiously. By the 20th of June it is found in mature fruit and already trailing with branches several feet long, the upper nodes rooting in the mud, each forming a new plant. Between the years 1860 and 1870 I was familiar with the plant, in southern Wisconsin, when, being discontent with it as a mere form of *R. repens*, as it was then called by the authorities, I labelled it *R. hispidus* in my herbarium. The name well enough answers to its character. It is almost hispid, whereas the real *R. hispidus* is only hirsute. Some more recent "authorities" have concluded it to be a form of *R. septentrionalis;* and lastly, it clearly enters into the composition of the aggregate *R. Macounii*, the main part of which is an exceedingly different small-flowered plant of far-western mountain districts.

The above diagnosis is from material of my own gathering in southern Wisconsin in 1888, and in southern Michigan in 1902.

R. Illinoensis. Perennial, the roots many, coarse, fleshy-fibrous; the several stems a foot high more or less, at first flowering scarcely exceeding the longest basal leaves; herbage green but under a lens sparsely appressed-pubescent; a few of the very earliest leaves rounded, only very obscurely if at all lobed, those next them with 3 broad rounded lobes, the latest basal and earlier cauline 3 to 5-parted or merely lobed, the lobes or divisions oval to oblong, entire: peduncles solitary or 2 or 3 terminating each of the several stems;

sepals ovate-acuminate, thinly hirsute, scarcely reflexed; petals 5, large, more than ½ inch long, cuneate-obovate to obovate-oblong, very obtuse: achenes thick, smooth, rounded in outline, carinate on the back by a green-herbaceous margin confluent with the long slender not at all recurved but straight style.

Collected at Alto Pass, in southern Illinois, 21 April, 1900, by Mr. Carl F. Baker, who reports that it occurs in large patches on moist open hillsides. It is of the group to which belong *R. hispidus* and *R. fascicularis* and more like the latter yet differing widely in aspect by its much greater size, uncut basal leaves, these being fully as broad as long, and only slightly if at all lobed; while in the achene with its long straight style we have an excellent technical character. The region is one which has yielded already a number of rather local species in various genera.

R. POLITUS. A large stout perennial with very coarse fleshy-fibrous roots, but the stems though thick, weak and partly reclining (perhaps ultimately rooting at the upper joints), polished and shining but sparsely pilose-pubescent, 2 feet long while yet in early flowering: lowest leaves on petioles of 6 or 8 inches, ternately divided, the segments cuneate at base and incised, the lobes and teeth not acuminate, scarcely even acute: sepals very thin, ovate, apparently never reflexed but very promptly deciduous: corolla 1½ inches broad, the five petals broadly obovate, very obtuse: achenes smooth, moderately compressed, not large, surmounted by an ensiform but acuminate beak as long as the body, decidedly incurved but its small tip abruptly recurved, the whole forming a somewhat depressed-globose head.

A subalpine plant of the mountains of eastern Oregon, by W. C. Cusick (n. 2382 of my set), wrongly named *R. maximus*, Greene, which is a very different almost maritime and

somewhat local plant of middle-western California. The corollas in this present plant are among the largest and most beautiful in the genus.

New Species of Polygonum.

First in the following series are proposed new members of the *Bistorta* section of the genus; segregates, they may be deemed, of *P. bistortoides* and *P. viviparum;* a group in which the roots are among the most essential organs; and yet, perhaps one-half of the numerous specimens preserved in the herbaria show no trace of the root. And, inasmuch as I decline to name species of which the root is unknown, there will still remain, especially in the U. S. Herbarium, numerous sheets which I dare not refer to any of the published species.

P. linearifolium. Stem 18 inches high, very erect, from a stout contorted but neither fibrous nor chaffy-coated root: lowest leaves 3 to 8 inches long, oblong-linear and linear, then, tapering to both ends, scabrous beneath, the veinlets above becoming raised and prominent near the somewhat revolute margin; midvein beneath broad, flat, 2-striate; cauline leaves 2 inches long or more, still narrower than the basal, and auricled: spike ovoid, ¾ inch high; bracts ovate, cuspidately acuminate.

Such are the characters of the plant named in the King's Expedition Botany by S. Watson *P. Bistorta*, var. *linearifolium* and there too imperfectly described. The existence of several other good species having the character of linear leaves has rendered needful this more detailed description. The type, according to Mr. Watson's notes, is from the East Humboldt Mountains, Nevada, and a good specimen, very likely the actual type, is well preserved in the U. S. Herbarium.

P. CEPHALOPHORUM. Root not large, nearly or quite perpendicular, several inches long, hard and woody-looking, scarcely chaffy, not contorted but merely tortuous, crowned by a somewhat tuberiform subglobose enlargement, this supporting the small basal leaves and rather slender erect stems, 1½ feet high: lowest leaves firm, lance-linear or oblong-linear, 1 to 3 inches long including the short petiole, the few and reduced cauline ones attenuate at apex, all scabrous pubescent beneath; ocreæ 1 inch long, cylindric, closely sheathing the stem, herbaceous throughout: flowers in a dense hemispherical and capitiform spike, or this sometimes a little longer and ovoid; bracts short, thin, inconspicuous, ovate, merely acute.

The type specimens are in my own herbarium, and were collected in the Sierra Nevada, Calif.; on Mt. Conness, 3 Aug., 1890, by W. G. Harford.

P. VULCANICUM. Two feet high and stoutish, from a thick and short horizontal superficially seated straight root: lowest leaves 8 to 10 inches long, erect, long-petioled, the oblong blade tapering very gradually to the petiole, somewhat cuspidately acute at the broad summit, thin, bright-green, and glabrous, not revolute nor obviously venulose, the midvein beneath broad, liguliform, striate, the cauline small, sessile, amplexicaul, their ocreæ 2 inches long, altogether herbaceous: spike solitary, subglobose and capitiform, about 1 inch broad; flowers white.

Upper Camp Spring, Crater Lake, Oregon, 14 Aug., 1896, E. T. Applegate; the specimen in U. S. Herbarium.

P. JEJUNUM. Root thick and contorted: stems very slender, 5 to 10 inches high: lowest leaves lance-linear, oblong-linear, and linear, the largest 2 inches long; on short and slender petioles, of firm texture, scaberulous beneath, the flat midvein pervaded by a single median nerve, transverse veinlets

not manifest except near the margin, there very prominently raised, light-colored and conspicuous, in form and arrangement recalling the young sori of some simple-fronded *Asplenium;* cauline leaves narrowly linear, sessile, their long ocreæ ending in a short and cyathiform scarious margin: spikes round-ovoid, ½ inch high: flowers white, their bracts ovate, acuminate.

The perfect type of this is Mr. Flodmans' n. 386, as in the U. S. Herb., from Spanish Peaks, Madison Range, Montana, 14 July, 1896. Rydberg and Besseys' n. 5357, from Indian Creek in the same State, 1897, is evidently of this species. The little cup-like margins of the ocreæ are peculiar.

P. Bernardinum. Stems upright, tufted on a stout contorted and rather coarsely fibrous-coated root, themselves about a foot high, stout, but the leaves are small, the basal scarcely larger than the cauline and 2 or 3 inches long including the short petiole to which the blade is somewhat rounded, scarcely acute at apex, thickish as to texture, veinless, glabrous, inclined to be revolute: spikes ovoid, about ¾ inch long; flowers white; floral bracts ovate, acuminate.

Bluff Lake, eastern base of the San Bernardino mountains, California, at 7,400 feet altitude, S. B. Parish, 24 June, 1894. With its stout sheathed stems and remarkably small foliage the plant is reedy-looking by the side of others of similar height.

P. glastifolium. Stout and tall from a short thick knotted or contorted root: lowest leaves erect, often a foot long or more, on a long stout petiole; blade elliptical to oblong, 5 to 8 inches long, the cauline oblong-lanceolate, sessile, 2 or 3 inches, the upper face of all smooth, somewhat glossy, finely reticulate, the lower face glaucous and as if lepidote-puberulent, the broad flat midvein 3 to 5-striate;

ocreæ 2 inches long or more, thinnish, at summit subscarious; spike oblong, $1\frac{1}{2}$ inches long; bracts ovate, remotely dentate, subaristate-pointed: flowers white.

A rank species of wet lowlands in Idaho and eastern Washington, not montane. It is well represented in Sandberg's n. 400, from Potlatch River, 16 June, 1892, and as collected by L. F. Henderson near Moscow, 27 May, 1894; both from Idaho, and seen in U. S. Herb.

The *Persicaria* section is in need of a thorough revision, especially as to the group of aquatic species; but the following new ones are properly terrestrial.

P. OMISSUM. Annual, erect, a foot or two high, somewhat dichotomous, the whole stem as well as branches and peduncles rough with rather sparse stipitate glands, but foliage glabrous even to the margin; stipules very short, cup-shaped or some almost saucer-shaped, none in any part truly investing or sheathing the stem, scarious, glabrous, naked and even nerveless: leaves about 2 inches long, including the rather long petiole, oblong-lanceolate, puncticulate but not pellucid-glandular: racemes all short and nearly oval; perianths large, deep pink, styles exerted: achenes round-ovate, cuspidate-mucronate, black and shining, nearly flat on one face, notably convex on the other.

Type specimens collected by myself at Greeley, Colorado, 20th September, 1872. It is no rarity there and elsewhere along the Platte River, and has long been allowed to pass for *P. Pennsylvanicum*.

P. FALLAX. Annual, erect, rather slender, 1 to 2 feet high, simple below, paniculately branched above and copiously floriferous, the cylindric spiciform racemes small and narrow: leaves rather narrowly lanceolate, 2 to 4 inches long,

glabrous and glandless above, rather copiously pellucid-glandular beneath when young, later whitish-tomentulose, the margin very minutely spinulose-serrulate under a lens: ocreæ hyaline above, purple-nerved below, a red-purple ring around the nodes at base: peduncles glandular-scabrous; the very small perianths rose-color: achenes round-ovate acute.

Tules of Grand Rond Valley, eastern Oregon, August, 1897, W. C. Cusick; distributed for *P. Persicaria*, though its real affinities are with *P. lapathifolium* and its allies; yet, by its gland-dotted lowerleaf-face, it is again divergent from all other members of that group.

P. ARCUATUM. Perennial, not slender, the stems several feet long and nearly prostrate, not branched, assurgent at summit and there bearing one or more long linear slender-peduncled spiciform racemes; internodes of the stem an inch or more long, acute, smooth and glabrous, reddish: ocreæ cylindric, thin, without herbaceous border, closely and rather coarsely appressed-strigose and long-ciliate: leaves about 3 inches long, linear-oblong to lance-linear, obtusish, obscurely punctate, glabrous except as to midvein beneath and margin, these closely appressed strigulose, each marked with a dark blotch above the middle; perianths small, pinkish, not glandular, their segments very obtuse; achenes minute, nearly orbicular, shining, but under a lens scrobiculate.

Bed of Napa River, above Hunt's Meadow, Napa Co., California, 5 Nov., 1894, F. T. Bioletti. The locality is under the influence of tidal water, the soil therefore subsaline.

Since the time, now long past, when the initiative was taken by me in the critical investigation of far-western forms of the *Avicularia* section,[1] the number of recognized

[1] Bull. Calif. Acad. i. 124–126 (1885).

species peculiar to the western slope has grown to be considerable; and now the following must be proposed in augmentation of the number.

P. CONSIMILE. Allied to *P. Engelmannii*, like it in habit, but larger, less compactly branching, rather more erect, the largest plants a foot high; stems subterete, only the floriferous branches angular, herbage destitute of scurfiness: leaves spatulate-linear, the largest $1\frac{1}{4}$ inches long, veinless, acute, the hardy scabrous margins revolute; stipules when young and untorn bearing 2 or 3 setiform teeth: perianths mostly solitary at the nodes (and these more than an inch apart as to the lower), much more elongated and narrow than in *P. Engelmannii*, and tightly closed over the achene, this with narrowly rhomboid faces and the whole scarcely shining, impressed-puncticulate under a strong lens.

The type specimens of this abundantly distinct relative of *P. Engelmanni* have been lying in my herbarium without a name, ever since 1889, and were collected by myself in the mountains at Beaver Cañon, Idaho, near the Yellowstone Park, in August of that year. Meanwhile some starveling specimens of the same have been collected by A. and E. Nelson in the said Park, and distributed by them under the name of *P. Engelmannii*. In my set of that collection, the label for these bears the number 6236.

P. VAGANS. Also akin to *P. Engelmannii*, of more spreading habit, but of the size of the largest *P. Douglasii*, the long tortuous sparse-flowered branches almost prostrate and very few, green without any red or purple tinge, subterete, the longest more than a foot long, the lower internodes $1\frac{1}{2}$ inches long: leaves an inch long, spatulate-linear, smooth and veinless above but the midvein beneath sharply carinate; ocreæ altogether short and obscure: perianths several at

each node, erect in maturity, closely enwrapping the whole achene, this as large as in *P. consimile*, its faces less regularly rhomboid, being broadest quite below the middle, the whole devoid of puncticulation and very highly polished (as in *P. Engelmannii*).

Known only as collected by myself in the West Humboldt Mountains, Nevada, 1 Aug., 1894. An obscure plant, though not small, the branches being few and widely straggling.

P. FLEXILE. Strictly erect, branched only above the base and somewhat paniculately, 2 feet high or more, the herbage deep-green, glabrous: stem about 8-striate, the lower internodes 1½ inches long: leaves of main stem 1¼ inches long, elliptic oblong, plane, only very obscurely pinnate-nerved above, beneath exhibiting a sharply carinate mid-nerve only, the margin entire even under a lens; stipules very thin and scarious, at length torn to the base into about 8 segments, these nerved below: perianths solitary, distinctly and slenderly pedicellate, often nodding in fruit, as green-herbaceous as the foliage itself excepting an extremely narrow whitish margin: achenes black and shining but minutely puncticulate, the sides deltoid-ovate, concave.

Type from the plains near Denver, Colorado, collected by myself in 1870. Plant of the size of *P. ramossimum*, but with little or no resemblance to it, the branches being slender, flexible and paniculately spreading; the hue of the herbage totally different and quite like that of ordinary so-called *P. aviculare*.

VIOLA INDIVISA, Greene.

VIOLA PEDATA INORNATA, Greene (abnormal).

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BY

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REVISION OF ESCHSCHOLTZIA.

Of early discovery among Northwest American plant types, this genus was late in gaining a name and definition. Menzies, the botanist of Vancouver's voyage, is said to have gathered, as early as the year 1792, specimens of it which were afterwards distributed to several herbaria as representing a new genus perhaps allied to *Chelidonium*; but no name was assigned the type until eighteen years later when Chamisso, botanist to Kotzebue's voyage, himself having collected at San Francisco in 1816 that which now stands as the type of the genus, published it at Berlin, under the name of *Eschscholtzia*, as a new generic member of the Papaveraceæ. This was in the year 1820, up to which time only dried specimens of these plants had been seen in Europe. In 1830 Douglas, exploring the valley of the Willamette, in the interior of Oregon, discovered an *Eschscholtzia* there which he supposed to be Chamisso's *E. Californica* and sent seeds of it to England. This has long been known as *E. Douglasii*, and is in cultivation almost everywhere, and under many garden varieties, some of which are doubtless of hybrid origin. Subsequently the same collector, from several parts of California, sent seeds of various Eschscholtzias, as well as dried specimens, to his English correspondents and patrons, and from these specimens Bentham in 1835 published four new species which, added to the original one, raised the number to five; this author still supposing that Douglas' plant from the Willamette was the same as that of Chamisso from the sea coast at San Francisco, an error which the British botanists among themselves discovered and corrected somewhat later, thus giving recognition to *E. Douglasii* as the sixth member of the genus, to which, before 1840 a seventh, *E. compacta*, had been added.

Up to that time, despite the fact that *Eschscholtzia* was an

American type, all the information that American botanists had concerning it they gained by way of England; and Asa Gray's presentation of the genus in the Torrey and Gray Flora in 1838, was but a compilation from English authorities; though he remarks that *E. Californica* and *E. crocea* "are now common in our gardens," and might have added that they had found their way there, not from California directly, but only by way of English gardens. Being in 1838 without facts on which to base an opinion of his own as to the number of species in the genus, he adopts Chamisso's original one and the four that Bentham had then recently added, making five in all. It is remarkable in the history of *Eschscholtzia* that during the first fifteen years after the publication of the genus, more work was done upon it than during the succeeding half-century. After the appearing of Bentham's paper of 1835, very little was added to the knowledge and understanding of these plants until the year 1885; and this notwithstanding the fact that early in that fifty-years period, intercommunication had been opened between the States and California, so that it was no longer needful for American botanists to ask their English colleagues for information about Californian plants. But, despite all these advantages, scarcely an item of new knowledge had been gained by us, and the old had been in so far lost that American authority as it spoke in 1876, made next to no account of Bentham's work, reducing all his and Lindley's species to the original *E. Californica;* just the kind of result that usually follows, not advancing knowledge, but deepening ignorance.

Bentham himself in the Plantæ Hartwegianae in 1849 had felt and expressed a rising doubt as to whether the species of this genus were more than one; and authors are apt, in later years, on some hasty review of an earlier piece of work, to doubt its validity. But again in 1862, as if having now gone carefully over the old ground, Bentham reasserts it, in the Genera Plantarum, that the species are four, if not five. Nevertheless, fourteen years later, in what I have long viewed as the weakest of all books of American botany that ever appeared under so great

pretensions and in such admirable dress—Brewer and Watson's first volume of the Botany of California—all the seven or eight species of *Eschscholtzia* which British botanists had grown in their gardens, and published with fine plates, were reduced to Chamisso's original *E. Californica;* and the one asset against all this lack of knowledge which the book betrays, is that of the establishment of one new species, *E. minutiflora*, the habitat of which is the desert region of the Great Basin beyond the borders of California.

During the nine years next succeeding the publication of Brewer and Watson's book of 1876, there is little evidence of any further investigation of *Eschscholtzia*. The authors of the book had known nothing of the fact that at least in some kinds the cotyledons are bifid ; but in 1879 an editor of the Botanical Gazette had chanced to discover this interesting peculiarity and proceeded to announce it as a new discovery. But Spach away back in 1839 had observed this and recorded it as one of the characters of the genus. Dr. Engelmann in 1881, being on the very ground whence the original *Eschscholtzia* had come, found the plant, contrary to what was set forth in the new book, a perennial, and proceeded to publish this as a new fact. His paragraph is in the Botanical Gazette for that year. But to botanists resident in California this was no news. Even Chamisso in 1816 had observed the fact, and in publishing the species had said that it is perennial. So also is that Oregonian species which, in Old England and New England, they had supposed to be *E. Californica*, and because its roots were too tender to survive their winter's, they had announced to be annual.

In the spring of 1884 the present writer had already, at different times, spent five seasons botanizing in California, without yet having become specially interested in *Eschscholtzia*. But this year, investigating and collecting in a part of California before unvisited, he noticed growing along the borders of a wheat field an *Eschscholtzia* of very strange aspect. Its small flowers were most unlike those any known to be exhibited in that genus. They were cruciform, the petals narrow and stand-

ing apart; and before noon of the day it was observed that all the petals had fallen, and the observer had to wait until the following morning to see the corollas of this plant again. The other specific marks were several and pronounced; and early in the following winter I completed a diagnosis of the species; not, however, without having studied critically all the goodly amount of *Eschscholtzia* material at that time extant in the herbarium of the California Academy of Sciences. The outcome of this study was a paper published soon after in the Academy Bulletin, in which recognition was given to eight species, of which five were new. In another article issued in the same volume a few months later two other species were added, these raising the whole number of Eschscholtzias to ten. Of these, seven were mine and proposed as new; only one of the six or seven that had been early published by English authorities obtaining recognition; this fault of the paper being due to the implicit faith I then had in the approximate infallibility of Asa Gray who had pronounced against the validity of those species, and whose pronouncement, thus believed in, kept me from the investigation of them; and so I read with humiliation now, on page 68 of that Bulletin, my own saying about such excellent types as I now know *E. crocea* and *E. Douglasii* to be, that they do not seem to deserve even varietal names.

Other crudities in this my earliest monographic effort are now to me, after the lapse of twenty years, so apparent that I never refer to the document unless obliged to do so. Nevertheless, and despite its failings, fairly considered, it must seem to have been predestined to mark strongly an epoch in the history of the genus. Every paragraph of it is replete with the statement of important facts never before made known, and the diagnoses of the new species in that paper are the first diagnoses of Eschscholtzias printed, after Chamisso's original of *E. Californica*, that appear to have answered the purposes of diagnosis by compelling, as it were, the recognition of the species, and that even in quarters where there had been, at the time of their first appearing, an outspoken prejudgment against them.[1]

[1]American Journal of Science for 1885, p. 321.

Bentham's four, earlier than mine by fifty years, were so brief and otherwise inadequate, that none after him were able to recognize the species; and many authors confused all four with the original *E. Californica.* I think all of them are valid; but the definitions in each case, are so loose as to cover not merely a species but a group of them, as we now apprehend them.

The scientific force and value of that imperfect paper of 1885 lay in its essential originality. The diagnoses were framed upon no model. I had discovered characters in *Eschscholtzia* upon which species could be established. It was a discovery that had been waited for by my contemporaries. I had also indicated in terms that proved to have been intelligible, what the characters of certain species are.

Linnaeus once upon a time introduced a chapter upon nomenclature by giving a classification of nomenclators. He might also have given a classification of the classifiers of plants. Something like what follows would not have been far wrong.

As to powers of taxonomic discernmment, there are a few who, having before them several related plants, can see, and do see, of their own discriminative intelligence, the differences that separate them.

There is a much larger class of those who, in the same case, seem blinded by the resemblances which these related things so strongly bear to one another, and cannot see the differences at all distinctly until some other has pointed out those differences one by one. Then, these too can see.

There is a third class, consisting of such as can not see a thing that is before their eyes and has been pointed out.

Nor may one quite exclude from the category of botanists the blind who are so because they will not see; among whom are such as use a dilute botany as the medium of that invective and vituperation by which they would avenge personal injuries, real or imaginary.

When in 1886 Dr. Gray, with specimens before him, undertook his patient and fair-minded investigation of that monograph of which he had at first spoken more or less disparagingly, it is

evident his earlier judgment of its merits was reversed; for that which he soon after set forth as his new scheme[1] of *Eschscholtzia* for the Synoptical Flora was no other than my own scheme in every essential particular. Under the circumstances it was but human and natural that his adoption of it should be made with a certain coldness, and even almost grudgingly.

To a man in a conspicuous place, the one not prominent might well be advised to offer the light of new knowledge warily, and privately. Then the enforced acceptance of it—for with fair minds evident truth compels acceptance—will possibly be made with thanks; but to do this benefaction in print, and publicly, is more likely to be received as almost of the nature of an affront, and the benefactor may be treated as an offender. To no such extreme would the author of the Synoptical Flora be carried; and the general coldness of his copying is tempered by one or two not unkindly allusions to as many of the very many new facts I had brought out. But later, the editor of Gray's pages used a freedom of adverse comment out of all proportion to his own inconsiderable knowledge of these plants[2]; and in the position in which he has publicly placed himself by his supplementary paragraph upon *Eschscholtzia* he will not be envied. Quoting some palaver he has listened to from some one whom he calls "cautious"—thus relegating, unwittingly, even Dr. Gray to the category of the incautious—he says: "It is affirmed by the more cautious California botanists, who have taken no part in the discussions relative to this genus that plants which early in the season bear large and deeply colored flowers are apt later to produce small and paler ones."

Now, had the editor given heed to what had been printed regarding these things in the Flora Franciscana[3] five years earlier, he might have been able to say to his informant: "But were you not taught all this by Mr. Greene himself? He stated this case definitely in the Flora Franciscana." I say the

[1]Proc. Am. Acad. xxii 271.

[2]Syn. Fl. i 467.

[3]Fl. Fr. 285. under *Douglasii*, *crocea* and *compacta*.

editor might well have given such answer, and so might have saved himself the misfortune of that paragraph in which every implication and assertion that relates to me—and none will doubt that against me alone every line of it was written—is truthless. Not the kind of misrepresentation that is conscious and intentional, certainly. It was only a case of speaking without knowing; of listening to a prattler who had a grievance, and willingly going into print with the prattle, trusting it might be true, but without waiting to investigate.

In respect to the work of twenty years ago, what I did upon *Eschscholtzia* was accomplished with ease and quickly. The present attempt, on the contrary, has proven the most trying and difficult of all taxonomic tasks I have undertaken hitherto. The accumulations of herbarium material have, within the twenty years, become augmented perhaps twenty-fold; and the difficulties of classification, if partly diminished by the abundance of data, are also in a measure increased thereby; for so great sacrifice of time is involved in strict and careful comparisons, that one is tempted, often through weariness, to neglect it, to the confusion of things that are distinguishable and ought therefore to be separated.

To one who knows many Eschscholtzias in their native haunts, nothing is more certain that the habit differs widely in different species; some at their perpection of development forming extensive mats of prostrate branches, and bearing countless flowers and pods on short peduncles in what seem the forks of the branches. Others at the same stage show no stem or branch at all, but only a tuft of leaves and a mass of scape-like peduncles upright from amid them. And there are species between which, at their maturity of growth, this habital difference is more distinctive than any other marks they bear. Yet one of these may be the denizen of a sea beach or bluff, subject to sea fog and spray, the other peculiar to some sunburnt desert, it may be fifty or it may be five hundred miles inland; so that of their specific distinctness there could be no doubt were they more alike than they are. But what is the herbarium botanist

to think or to do when assured that the most diffuse mat of a perennial and dichotomous *Eschscholtzia* begins its course of flowering and fruiting without a branch, and with one or more scape-like peduncles rising from amid a bunch of radical leaves? A considerable proportion of the species do, in each individual plant run through such phases; while in another set of species no individual passes, even in its fullest maturity, beyond a stemless and scapose development. Now in the herbaria, where a certain habital peculiarity may mean either the permanent state of a species and a specific character, or it may mean only a transitory phase and therefore of not the least diagnostic value, how is one to assort the specimens and learn what scapose specimens belong to scapose species, and what are but passing stages in the development of some freely branching kind? This is one of several hard problems that have perplexed me as a student of this genus during a number of years. The fact, however, that the species, be they few or many, fall readily into two groups by characters of the torus that are entirely constant—a fact that I saw clearly and gave to the public twenty years since—reduces greatly the difficulty. And, for a clew to the species in whatever stages of development, I seem to have found at last, after great labor in comparing almost countless specimens, that the leaves, the calyx, and when you have them, the pods and seeds may be depended on.

As to the leaves of *Eschscholtzia*, the phytoptically blind will say that they are all alike; all the same they differ in many ways and widely; and their characters as to hue, as to pubescence, as to general outline; the relations of the divisions and the ultimate segments, as well as their forms, angles of divergence, etc., seem constant in each species, at whatever stage of growth.

Equally to be relied upon are characters of the calyx. Not but that this organ is, in many a species, subject to considerable differences of form according to its age and degree of development in the individual plant; so that one may find, in a well grown plant full of buds, much diversity according to the stages of growth they are in. Still, in other kinds there is little

dissimilarity between the youngest buds and those more near full growth except as to size. But the availibility of the calyx for diagnostic and taxonomic purposes lies in the fact that, at its full development it is always the same, whether in the young and subacaulescent or in the later and freely branching stages of the plant's career. I therefore always describe it only as it appears within a day's time of the expansion of the flower.

The size, form, and even the texture of the pods are matters of equal constancy within specific limits. That formed on the early scapiform peduncle is found to be neither larger, nor otherwise different from those of months later on the most diffuse branches, this holding, even where the corolla differs as to size and color in young plants and old.

That the species are so numerous, one might well regret; especially the monographer; for half the number would have involved perhaps but half the time and toil in their diagnosis and arrangement. But nature has yielded them; doubtless even more of them than are here enumerated. And that there should be 112 Eschscholtzias ought to surprise no one who is acquainted with the strong development of other phanerogamic genera upon exactly the same territory which this genus occupies.

On the Pacific side of our continent *Ceanothus*, a genus of rather large shrubs, is almost exactly coextensive in its general range with these poppy-like herbs, where it exhibits about 60 species. But this important fact is to be noted, that whereas *Ceanothus* is confined to the hillsides and mountain slopes, *Eschscholtzia* grows both there, and also most copiously upon the different levels of all the valleys and upon the lowest and broadest expanses of the plains, where never a ceanothus appears at all. From the point of view of this one circumstance it would be perfectly reasonable to expect the papaveraceous herb-genus to present twice 60 species; and if to this are added the consideration of how vastly the herbaceous genus exceeds the shrubby one in the number of individuals, and otherwise multiplies its own chances of the evolution of new types. none

could wonder if it were to embrace four times the 60 species that Ceanothus holds.

Lupinus, upon *Eschscholtzia* territory, presents us with nearly or quite 140 species; *Eriogonum* 150 at the least, and *Trifolium* with more than 100, though the latter does not accompany the poppies at all to one of their favorite fields, the extensive desert plains.

These are a few instances out of many that might be cited to show it both reasonable and philosophical to expect even further additions to the present list of *Eschscholtzia* species. A great part of its territory has not yet been half explored botanically. The investigation of the genus will continue for many decades to come—doubtless even for centuries; and, for a time, if not for always, the present effort, incomplete everywhere, and faulty in many respects, will nevertheless be found stimulating and helpful.

* Outer margin of torus not obscure, often developed as a more or less coriaceous or cartilaginous rim either broad and spreading, or, in fruit deflexed. Stamens mostly 40 or more, indefinite. Cotyledons deeply bifid, the segments narrowly linear and divergent.

+ Perennials.

Plants leafy and floriferous throughout, prostrate or nearly so and notably false-dichotomous, the peduncles short, in the forks.

Calyx ovoid, abruptly very short-pointed;

Herbage glabrous, glaucescent........................1. *E. Californica*.

Herbage white with bloom, rough with a short subpapillose indument........................2 *E. maritima*.

Calyx subconic-ovoid, short taper-pointed; herbage glaucous, scantily scabrous........................3 *E. Menziesiana*.

Calyx oblong conic, taper-pointed; herbage finely pubescent; leaf-segments narrow........................4 *E. fœniculacea*.

Calyx ovoid, abruptly long-pointed; herbage scabrous; leaf-segments broad........................5 *E. cucullata*.

Plants leafy and floriferous throughout, widely branched, decumbent or ascending, with little or no appearance of dichotomy;

Herbage very glaucous, glabrous;
  Calyx ovate-conic, long taper-pointed..........6 *E. glauca.*
  Calyx oblong-ovoid, abruptly long-pointed..........7 *E. debilis.*
  Calyx oblong-conic slenderly short-pointed..........8 *E. Eastwoodiæ.*
Herbage glaucous, partly scabrous, or even pubescent;
  Calyx round-ovoid, with abrupt short point..........9 *E. benedicta.*
  Calyx ovoid, abruptly short-pointed;
    Torus-rim reduced, thickish, turgid..........10 *E. juncea.*
    Torus-rim narrow, thickish, reflexed..........11 *E. leucosticta.*
  Calyx thin, subconic-ovoid, with short stout taper point..........14 *E. Columbiana.*
  Calyx thin, ovoid, acuminate..........15 *E. Biolettii.*
  Calyx firm, round-ovoid, very short-pointed..........16 *E. marcida.*
Herbage merely glaucescent, glabrous;
  Calyx thin, ovoid, with abrupt short slender point;
    Herbage green, faintly glaucescent..........12 *E. Helleriana.*
    Herbage paler, plainly glaucescent..........13 *E. Douglasii.*
  Calyx firm, ovoid, long-pointed..........17 *E. Shastensis.*
Herbage glaucescent, partly scabrous;
  Calyx thin, conic-ovoid, rather abruptly long-pointed..18 *E. Yainacensis.*
  Calyx firm, ovoid, abruptly long-pointed..........19 *E. apiculata.*
  Calyx thin, oblong-ovoid, abruptly very short-pointed..........20 *E. granulata.*

Plants more sparsely leafy, upright, often rigidly so and the branching more or less paniculate;
  Very glaucous; foliage smallish, the segments few, short and broad (narrow in n. 21);
    Margins of petioles scabrous;
      Torus-rim wide, firm..........21 *E. stricta.*
      Torus-rim narrow, thinnish;
        Calyx middle-sized, round-ovoid, short-pointed..........23 *E. confinis.*
        Calyx very small, ovoid, short-pointed..........24 *E. xylorrhiza.*
    Plants wholly glabrous;
      Torus-rim narrow, calyx ovoid, short-pointed..22 *E. leptandra.*
      Torns-rim wider;
        Calyx long, nearly conical..........25 *E. angularis.*
        Calyx ovoid, short-pointed..........26 *E. absinthiifolia.*
      Torus-rim thin, whitish, only papery when mature..........27 *E. nitrophila.*
  Glaucescent; leaves usually large, with long and rather narrow segments;
    Neither corolla nor calyx large, the latter ovate-conic with short taper point..........28 *E. procera.*

Corolla very large, orange-color ;
Calyx large, long-conical....29 *E. crocea.*
Calyx thin, oblong-conical, taper-pointed....30 *E. macrantha.*
Calyx large, ovoid-conical, abruptly stout-pointed.31 *E. sanctarum.*
Corolla middle-sized, orange-color :
Torus inflated and bladdery....32 *E. scariosa.*
Torus not inflated ;
Calyx subconic-ovoid, abruptly short-pointed....33 *E. rigida.*
Calyx ovoid, with abrupt stout long point....34 *E. recta.*
Calyx slenderly ovoid-conical....35 *E. calosperma.*
Plants low, subacaulescent ;
Calyx long and subconical ;
Torus short-turbinate, with ample thin but revolute rim36 *E. revoluta.*
Torus narrow-funnelform, the rim ample, not revolute.37 *E. floribunda.*
Calyx short, ovoid ; torus-rim narrow ....38 *E. Brandegei.*

+ + Annuals.

Plants branched from the base, leafy and floriferous throughout, either prostrate or merely ascending, but obviously false-dichotomous.
Calyx narrowly oblong-conic, ½ inch long, with short blunt point....39 *E. Clevelandi.*
Calyx ovoid-conic, with prominent and not short point40 *E. australis.*
Calyx broadly and sharply ovate-conic : stigmas with persistent subulate base....41 *E. bicornuta.*
Calyx only ¼ inch long, ovoid, with short blunt point42 *E. microloba.*
Calyx ½ inch long, subconic-oblong, with abrupt very short point....43 *E. lacera.*
Plants branched from the base, more sparingly leafy and floriferous, and without obvious dichotomy.
Small and depressed, with scaberulous herbage....44 *E. ambigua.*
Large, less depressed, often lax, glabrous ;
Leaves ample, finely cut into narrowly linear long segments ;
Tall, with slender unequal stigmas, pods 2 inches long, seeds spherical....45 *E. tenuisecta.*
Low, with nearly equal stigmas, pods 3 inches long, seeds slightly ovoid....46 *E. cognata.*
Middle-sized, with stigmas very unequal, pods 2 inches long, seeds short-ovoid....47 *E. arvensis.*
Middle-sized, with stigmas equal....48 *E. isostigma.*
Leaves less ample, their segmentation shorter, the segments often broad, in many dilated upwards :
Segments short, linear, acute ; calyx conical ...49 *E. Orcuttiana.*

Segments spatulate-linear; calyx oblong-conical 50 *E. picta.*
Segments oblong-linear, obtuse, mucronulate; calyx subconic-ovoid........51 *E. Bernardina.*
Segments broad, obovate-oblong, obtuse, calyx small, acutely ovoid........52 *E. diversiloba.*
Segments cuneiform and tridentate; calyx large, conical........53 *E. thermophila.*
Segments of the uncommonly broad divisions few, narrow, acutish; calyx elliptic-ovoid, long-pointed........54 *E. straminea.*
Segments obovate-oblong, acutish; calyx oblong-conic, short-pointed........55 *E. vernalis.*
Segments linear, acute; calyx ovoid, long-pointed........56 *E. physodes.*
Segments few, dilated, upwards, then acute; torus turbinate, with broad rim........57 *E. peninsularis.*
Segments many, oblong, acute; torus subcylindric, with narrow rim........58 *E. aliena.*
Segments widely divergent, linear, acute; calyx large, ovoid-conic, pointless........59 *E. Jonesii.*
Segments widely divergent, acutish; calyx small, ovate-conic........60 *E. Arizonica.*

Plants usually subacaulescent and with scapiform peduncles from amid a tuft of basal leaves (rank specimens mostly with obvious short leafy branches): all the species glabrous;

Scape-like peduncles terete;

Leaf-divisions remote, divaricate: segments acute....61 *E. paupercula.*

Leaves more compact, their divisions less divergent;

Segments oblong, acutish; calyx round-ovoid, taper-pointed........62 *E. Mexicana.*
Segments oblong, obtusish; calyx subconic-ovoid, with slender point........63 *E. parvula.*
Segments unequal and diverse, one spatulate-oblong between two linear; torus funnelform with wide rim........64 *E. cyathifera.*
Segments oblong-linear, acute; torus inflated, obovate, truncate........65 *E. inflata.*
Segments cuneate-obovate and short; torus turbinate, with wide rim........67 *E. humilis.*
Segments diverse, one cuneiform and tridentate lobe between two oblong; torus turbinate, with wide rim........68 *E. exilis.*

Scape-like peduncles quadrangular; torus funnel-form........66 *E. quadrangularis.*

Plants upright and tall, branched only above the base, copiously leafy but sparingly floriferous throughout, and glabrous

Leaves glaucescent; segments linear, acute; calyx with short oval body and long slender point........69 *E. leptomitra.*

Leaves glaucous; segments shorter; torus with wide rim........70 *E. robusta.*

* * Torus with no obvious rim, both margins equally reduced and delicate. Stamens fewer, in some definitely 16, 12, 8 or even 4. Cotyledons never bifid or even notched, lance-linear or linear, entire.

+ Plants freely branched, leafy throughout.

Leaves ample, multifid, of a fine small lace-like segmentation All the species of insular habitat; unknown on the mainland.

Branched only above a stout and simple trunk, the whole plant of dendroid habit.

Leaf-segments long, linear, straight; pods delicately many striate; seed tuberculate........71 *E. crassula.*

Leaf-segments short, dilated at apex, two of each ultimate three convergent; pods strongly few-striate; seed reticulate........72 *E. ramosa.*

Leaf-segments long, linear-filiform, but tips dilated; filaments long, subulate........73 *E. trichophylla.*

Branched from the base but straggling, not dendroid; foliage smaller, but of lace-like short segmentation 74 *E. crossophylla.*

Leaves less ample, less multifid, their segmentation coarser and less open, not lace-like.

Branched from the base or near it, the branches erect or ascending, never decumbent;

Branches very leafy, firmly ascending; seeds tuberculate........75 *E. elegans.*

Branches more sparingly leafy (nearly naked in n. 76); seeds reticulate;

Plants glabrous, glaucous;

Leaf-segments many, linear; calyx small, ovate-conic, shortly taper-pointed........76 *E. Parishii.*

Leaf-segments broader, fewer, acute; calyx elliptic-ovoid, abruptly short-pointed....77 *E. ptarmicoides.*

Leaves small, triternate, the ultimate segments tridentate........78 *E. minuscula.*

Leaves small, once ternate or imperfectly biternate, the lobes broadly cuneiform....79 *E. rutæfolia.*

Leaves biternate, the divisions cut into 3 oblong lobes....................80 *E. biternata.*

Leaves ternately multifid; lobes irregular, short, obtuse....................81 *E. ludens.*

Plants scabrous; leaves of many short acute segments....................82 *E. asprella.*

Branched freely from the very base, the outer branches somewhat decumbent;

Leaf-segments broad, short, dilated at tip, divergent;

Plants more or less hirtellous or scabrous;

Branches low, rather equably leafy;

Calyx $\frac{3}{4}$ inch long, conical....................83 *E. eximia.*

Calyx $\frac{1}{2}$ inch long, ovate-conical....................84 *E. alcicornis.*

Branches taller, naked between the tuft of basal leaves and the leafy summit....................85 *E. hypecoides.*

Plants glabrous;

Calyx ovate-conic, acute; corolla $\frac{1}{2}$ inch wide; stamens 12....................86 *E. Covillei.*

Calyx obovate, obtuse; corolla $\frac{1}{2}$ inch wide; stamens 8....................87 *E. modesta.*

Calyx round-obovate, minute, corolla $\frac{1}{4}$ inch wide....................88 *E. micrantha.*

Calyx larger, ovate-conic....................80 *E. tortuosa.*

Leaf-segments long and narrow, hardly dilated at tip, little divergent;

Plants more or less hirtellous;

Low, stout, with large urceolate torus....................90 *E. urceolata.*

Low, slender, with long narrow-funnelform torus....................91 *E. cruciata.*

Plants glabrous, or with only a minute and obscure roughness;

Calyx 2 lines long, ovate, acute....................92 *E. minutiflora.*

Calyx 3 lines long, elliptic-oblong....................93 *E. pusilla.*

Calyx 1 inch long, conical, caudate-apiculate....................94 *E. caruifolia.*

Calyx 4 lines long, ovoid-elliptic, slenderly taper-pointed....................95 *E. rostellata.*

Calyx 4 lines long, ovoid-elliptic, shortly taper-pointed....................96 *E. vaccarum.*

Calyx ovate conic, with short minute point....................97 *E. Oregana.*

+ + Plants compactly tufted, the numerous branches pedunculiform, leafy only from the base to the middle or near it.

Herbage hirtellous in some part, or at least scaberulous (except in n. 100).
Plants pale and glaucous;
Peduncles 4-angled; calyx ¼ inch long, obovate, abruptly pointed........98 *E. petrophila.*
Peduncles 4-angled but with intervening lines; calyx ¼ inch long, oblong-ovoid, taper-pointed........99 *E. dumetorum.*
Peduncles terete; calyx short, round-ovoid, very short-pointed........100 *E. Bakeri.*
Peduncles terete; calyx oblong-conical, slenderly taper-pointed........101 *E. caespitosa.*
Plants of a deeper green, glaucescent.
Leaf-segments very narrow; calyx diaphanous, elliptic, with long slender point........102 *E. tenuissima.*
Leaf-segments few and broad; calyx opaque, elliptic-oblong, shortly taper-pointed........103 *E. Elmeri.*
Leaf-segments few and broad, calyx-ovoid, falcate-pointed........104 *E. incisa.*

+ + + Plants more compact, appearing as if acaulescent; no leaves obvious except those of the basal tuft, the peduncles scapiform.

Large plants with peduncles nearly a foot long;
Peduncles terete; pods 2 inches long........105 *E. formosa.*
Peduncles 4-angled; pods 4 inches long........106 *E. dolichocarpa.*
Smaller plants; peduncles a few inches high, 4-angled (terete in n. 112).
Leaf-segments many, broad and short; herbage glaucous.
Corolla cruciform, the petals fugacious; calyx small, glabrous........107 *E. rhombipetala.*
Corolla rotate, the petals deciduous; calyx papillose-hirsute........108 *E. Lemmoni.*
Leaf-segments few very long and narrow; herbage green; peduncles 4-angled;
Leaf-segments lance-linear; calyx ovate-conic, scarcely pointed........109 *E. Lobbii.*
Leaf-segments narrowly linear; calyx ovate, abruptly taper-pointed........110 *E. pulchella.*
Leaf-segments acerose: calyx elliptic, pointless....111 *E. unguiculata.*
Leaf-segments many, linear, obtuse; herbage glaucous, subsucculent; peduncles terete........112 *E. glyptosperma.*

1. E. CALIFORNICA, Cham. in Nees Horæ Physicæ Berol. 73. t. 15; Cham. & Schl. Linnæa, i. 554: Greene, Fl. Fr. 284. Perennial, glabrous, glaucescent, diffusely dichotomous, the branches commonly prostrate, forming a mat often a yard in width : leaves small for the plant and remote, ultimate segments oblong and spatulate-oblong, obtuse, the middle one of the 3 broadest: calyx ovoid, or even round-ovoid, abruptly and obtusely short-pointed, about ½ inch long: corolla small for the plant, nearly rotate, seldom 1½ inches broad, petals clear yellow from below the middle but with a well defined orange spot at base: stamens orange: torus-rim deflexed under the fruit and undulate: pods small, seldom 2 inches long: seeds spherical, strongly reticulate.

In this description matters of habit of the species, color of petals, etc., are from memory of the plant as I knew it intimately during more than ten years of residence in and near San Francisco. The best specimens before me are four sheets in my own herbarium, collected by myself at about the original station on the outskirts of San Francisco, three of them taken at the end of May, 1895, well illustrating the near approach to dichotomy which the plant always exhibits when grown to maturity, the fourth, a young specimen gathered in March, 1874, showing the beginning of its flowering by one or more almost scapiform peduncles arising from amid the tuft of early long-petioled foliage.

This type species of the genus I now judge to be limited to the maritime hills, more or less sandy, of the San Francisco peninsula. I can obtain no evidence of its ever having been under cultivation even in America much less in Europe; and all the so-called *E. Californica* of the various illustrated journals of botany or of horticulture represents some other species in every instance. It has been figured only by Chamisso, and in that case from dried specimens; and this plate in the

Horæ Physicæ, correct as to the impression it gives of the habit of the plant when well grown, is altogether misleading as to the corolla; for this shows the petals as if rounded off to the round-obovate, and so spreading as to show open spaces between them, whereas in nature they are triangular flabelliform, overlapping one another in such wise that the corolla as a whole appears as an unbroken circle. In coloring, too, the plate is false, for the upper part of each petal is made orange-color, the lower part light-yellow, though in nature just the reverse of this is true. But in the dried specimens the whole petal is apt to turn to a kind of dull deep orange, and the distinction of color vanishes.

2. E. MARITIMA, Greene, Pitt. i, 60. Perennial, prostrate, more slender than the foregoing, repeatedly and quite exactly dichotomous, the stem, leaves, peduncles and calyx white with a dense bloom augmented by a fine papillose, or on the leaves flattened and lamelliform and altogether somewhat crystalline indument; leaves on all branches and branchlets small, their short ultimate segments acutish, imbricated even in maturity: peduncles short, in maturity only about equalling the 1½ inch long pods; calyx ½ inch long, ovoid, scarcely apiculate, being obtuse at summit and surmounted by only a short blunt tip: corolla rotate, 1½ inches broad; petals light-yellow, at base orange; filaments shorter than the oblong-linear anthers; 4 stigmas very unequal; seed spherical, its reticulation not very definitely favose.

Principal habitat the Island of San Miguel, off the coast of Santa Barbara Co., southern California, where it was collected by the writer in 1886. It was subsequently cultivated by him on the mainland far northward, retaining under the altered surroundings and in garden soil, all its characters. Until very recently I supposed it to be endemic on San Miguel; but now I find a specimen in the herbarium of Parke, Davis & Co., of Detroit, collected in June, 1885, by Rev. R. W. Summers, on sand hills near Peche Beach, near San Luis Obispo. This

locality is far northward of San Miguel, and twice as far distant from it as are the shores of Santa Barbara Co.; and perhaps a knowledge of oceanic currents of the coast would explain whether the species was derived to the mainland shore from the island, or to the island from the mainland.

On Santa Rosa Island, in 1888, Mr. Brandegee obtained belated summer material of what I at first thought would be *E. maritima*; but a careful inspection of the fragment seen in Herb. Calif. Acad. reveals not only a perfectly glabrous herbage, but, what is more significant, buds with an abrupt and very prominent apiculation, as also a torus-rim much narrower than in any other member of the group. These fragments must, I think, be received as indicating for Santa Rosa its own peculiar species of this affinity; and that is just what our knowledge of the insular flora as a whole would lead us to expect.

3. E. Menziesiana. *E. Californica*, Sweet, Brit. Fl. Gard. iii. t. 265, not of Chamisso. Perennial, very glaucous, either glabrous or with more or less of a fine and sharp rather than coarse and papillose pubescence on branches and calyx; plant false-dichotomous and nearly prostrate: foliage very copious but leaves small and compact, their segments obovate and cuneate-obovate, very broad, often distinctly imbricated: peduncles short; calyx subconic-ovoid, abruptly tapering at apex, not exactly apiculate: corolla 1½ inches broad, widely expanding, petals yellow with orange base; torus-rim rather ample: pod 1¾ inches long: seeds small, spherical, yellowish-granulate under a lens, the strong reticulation distinctly favose.

Var. recedens, Of lax habit, the stems ascending; more densely fine-pubescent throughout, even to the growing ovaries and pods: leaves with long and narrow unimbricated spatulate-linear and linear segments: calyx less tapering and with more pronounced apiculation: seeds unknown.

Var. anemophila. Stouter than the type, equally diffuse and glaucous but glabrous throughout: leaf-segments narrow as in the last variety: calyx ovoid and with an abrupt and rather

long apiculation: seeds yellow-granulate, the reticulation irregular, not distinctly favose.

The type of this species is from along the sand dunes of Point Pinos, Monterey, Calif., and the specimens are chiefly of my own collecting in May, 1895, no duplicates having been distributed, all being preserved in my own herbarium. I have another of the same, but this wholly glabrous, received from Mr. Heller, who collected it on 8 April, 1903, and distributed it for *E. Californica*, from which the whiteness of its coating of bloom, the breadth and the overlapping of its leaf-segments, and the different shape of its buds mark it as distinct. On my first study of the specimens, I labelled all mine *E. maritima* because of their being glaucous like that, and also pubescent; but a more careful comparison brings out the fact that the nature of the pubescence is here quite different; that the buds have another configuration, and that even the foliage, in all but its whiteness with bloom, is of another description. The variety *recedens* grows on the verge of the sand hills and, notwithstanding its very different aspect, is but a variety. The case of var. *anemophila* is different. It is known only from Point Sur, a headland thirty or forty miles to the southward of Point Pinos, where it has been collected only by Mr. Brandegee and in late summer specimens which are rather poor. Both its buds and seeds are so unlike those of the genuine *E. Menziesiana* that I expect it to be proven a species some day.

Menzies, reputed to be the first botanist to have seen and collected an *Eschscholtzia*, is said to have obtained his specimens at Monterey. It is not pretended that the plant here named in his honor is the species which he collected. There are upland species back from the shore that are very different from this; and any one of these may have been his plant.

4. E. FŒNICULACEA. Stout perennial, with copiously leafy branches 2 feet long, commonly almost prostrate, densely and minutely pubescent, as also the stout petioles and petiolules: leaves ample, their segments narrow, almost parallel: calyx con-

ical or oblong-conical, 1 to 1½ inches long, more or less gradually tapering, usually puberulent: corolla orange, 2 inches broad: filaments uncommonly long, as also the stigmas, two of these shorter but the 4 attended by as many, or twice as many, that are much shorter: torus very large, its funnelform cup-like part ½ inch long, the firm spreading rim ½ inch wide: pod 3 inches long, or even longer.

Maritime, near Monterey and Castroville northward to La Honda, California, apparently collected only by Mr. and Mrs. Brandegee, April, 1889; specimens in Herb. Calif. Acad., and still better ones in Herb. Parish. The plant is as large, and as stout, at least in Mr. Parish's herbarium, as *E. cucullata*, and like it in habit, as nearly prostrate in age, etc., yet differing totally from that by its fennel-like slenderly cut foliage and a fine almost soft minute pubescence. Even the bundles of short, and as it were accessory stigmas, often eight of them over and above the principal four, seem to occur in all the specimens, and must be taken for another specific mark; though this prolification in the pistil is foreshadowed in one flower which exhibits four narrowly linear petals alternating with the four normal ones; this on sheet n. 2617, Herb. Calif. Acad.

5 E. CUCULLATA, Greene, Eryth, ii. 120. Larger than the foregoing in all its parts, the depressed branches forming a mat sometimes a yard wide, densely leafy, notably succulent, glabrous, or angles of stem and margins of petioles scabrous-serrulate, glaucous: leaves when young somewhat cucullate, in age outspread and with divergent segments all rather broad and acutish: calyx ovoid, with a stout abrupt apiculation as long as the body or even longer, the whole 1½ inches long: corolla 2½ inches broad, light-yellow with orange at base: stamens many, the nearly liguliform filaments and linear anthers of about equal length: stigmas 4, unequal: torus-rim ¼ inch broad: pod 3 inches long or more, stout: seeds spherical, yellowish with a coating similar to the favose reticulation.

This excellent maritime species was first described from a living plant, of which the root had been transferred to the botanic garden from Fort Bragg. Since then it has been collected by Miss Eastwood and by Mr. Brandegee at various stations along the coast from Fort Bragg to Point Reyes. It has, then, a more extended range than has its ally *E. Californica*, from which it is totally distinct by many characters.

I have in my own herbarium two sheets of specimens made from the original plant, and I must have distributed others at that time; for they are found in several herbaria, under the name *E. cornuta*, Greene, a name which I did not publish, though it had been perhaps a more fitting name than the one I gave later in print, especially in view of the remarkably long horn-like apiculation of the calyx; a character which is, however, less pronounced in the Point Reyes specimens, where the apiculation is both shorter and less abrupt.

6. E. GLAUCA, Greene, Pitt. i. 45, but not of Fl. Fr. 285, which is *E. juncea*. Perennial, glabrous, very glaucous, the ascending stems and branches 2 to 4 feet long, sometimes with rather obvious false-dichotomy: leaves large, multifid, the narrowly linear segments very long, moderately divergent: calyx ovate-conical, *i. e.* ovate with long and gradual at last slender point, about an inch long in early flowers, later smaller: corolla 2 inches broad, open-campanulate, the petals yellow, with orange spot at base, sometimes with also a narrow orange margin: stamens very many, the outer filaments broad, nearly liguliform, slightly tapering, the others quite liguliform, all wholly yellow; anthers very long: stigmas 4, stoutish, unequal: pods 2 inches long or more: torus-rim rather ample, herbaceous, commonly deflexed under the pod: seed spherical, reticulate.

Collected as indigenous only by myself, on Santa Cruz Island, 1886. Also seen in cultivation at Santa Barbara the same year, one specimen taken by me from a garden being now extant in Herb. Calif. Acad. But my type specimens show the plant only

in its reduced summer stage of development. The best herbarium specimens known to me were gathered by Mr. S. B. Parish from his own garden, where he cultivated it from seeds sent by me and from which he has distributed it, I hope, somewhat widely.

E. glauca is one of the largest of the genus, in combined beauty of foliage and flower surpassing all the others; and it may possibly be cultivated at present here and there; for I sent a considerable packet of seeds of it to one of our American commercial seedsmen; and, although I never heard of its arrival, I have seen in one or two eastern gardens what seemed to be this species. Though of insular habitat, the plant is not maritime, but inhabits clayey uplands.

7. E. DEBILIS. Perennial, with many weak apparently reclining slender branches nearly a yard long, sparsely leafy, freely flowering; herbage glabrous, glaucous, purplish: early leaves not seen, those of the branches small, of few and closely approximate linear acute segments; peduncles very slender, commonly 4 to 6 inches long: calyx opaque and dark-colored, oblong-ovoid, abruptly long-pointed, the whole about ½ inch long: corolla not large, little more than one inch broad in wide expansion: pods smallish, 1½ inches long; torus under them short-turbinate, with broad spreading rim and short delicate inner margin.

A marked species, possibly allied to *E. Californica*, but apparently of inland habitat, known only as in Herb. Calif. Acad. from Russian River Station, Sonoma Co., Calif., by G. A. Newell, Aug. 1900.

8. E. EASTWOODIAE. Slender rather diffusely branched perennial not large; glabrous, glaucous; branches rather leafy, the leaves not greatly dissected, their segments linear or oblong-linear, acute: calyx narrow, oblong conical, gradually and slenderly short-pointed: corolla orange, about 1 inch wide; stamens many, with short filaments and very long anthers: pods slender

barely 2 inches long; torus under them short, funnelform, with narrow and thinnish rim.

In Fresno Co., Calif. to the eastward of the interior valley of the State, in the foothills of Sierra Nevada, at Sequoia Mills, May, 1893, Miss Eastwood. Specimens in Herb. Calif. Acad.

9. E. BENEDICTA. Smallish and not stout, very glaucous perennial 8 to 12 inches high; branches decumbent or ascending from amid a considerable tuft of upright leaves, only the long scapiform earliest peduncle strictly erect: petioles from obscurely and obsoletely to very pronouncedly scabrous-ciliolate, all other parts glabrous: leaves compact as to segmentation, the short ultimate segments broadly spatulate-oblong, very obtuse: peduncles few and elongated: calyx about 8 lines long including the short stout abrupt point, the body round-ovoid, rather opaque: corolla deep-orange, widely expanding, less than an inch across: stamens very many, the narrow-linear wholly orange colored filaments very short; anthers excessively long: stigmas 4, short, unequal: pod 2½ inches long; torus short, subturbinate, only the moderately broad herbaceous rim obvious.

Types in Herb. Calif. Acad., by Miss Eastwood; a good nearly glabrous specimen from Lewis Creek, San Benito Co., Calif. 14 May, 1893; a smaller and very scabrous one fromCantua Creek, which lies not far distant, but in western Fresno Co., 19 May, the same year.

10 E. JUNCEA. *E. glauca*, Greene, Fl. Fr. 285, not of Pitt. i. 45. Perennial, with many slender wiry or reedy branches from the base, these decumbent or ascending, a foot high or more, sparsely leafy, very glaucous, more or less scabrous-puberulent near the base: leaves small, the basal upright, their long and slender petioles scabrous-edged, their blades cut into broadly linear nearly parallel acutish segments: calyx rather opaque, little more than ½ inch long, ovoid, abruptly short-pointed: corolla orange, 1 inch wide: pods about 1½ inches long

torus short, turbinate, striate, its rim reduced, turgid or thickish: seeds not known.

Type specimens in my own herbarium from some unrecorded station in the Santa Cruz Mountains, by C. C. Parry, 1888. The plant is so very glaucous that I tried to think of it as a depauperate mainland form of my then newly published insular *E. glauca*; and by this error, that name obtained a place in the Flora Franciscana.

11. E. LEUCOSTICTA. Allied to the last, much less slender, less glaucous, yet about as pale by a system of white spots on all the foliage marking the base of the primary divisions and first subdivisions, and also by a quite dense and fine short papillose pubescence on all the branches, petioles and peduncles: ultimate leaf-segments oblong-cuneiform, the middle one of each three broadest and cuspidately acute, the others merely acute: peduncles long and stout: corollas 1 inch wide: pods 2 inches long, minutely scaberulous; torus under them with narrow but thin and deflexed rim: seeds a little elongated, the usual reticulation wanting but replaced by scattered soft subpyramidal low protuberances either distinct or inclined to run into an obscure rugosity.

Remarkable species, apparently gathered only by Mr. Brandegee at Ben Lemond, Santa Cruz Co., Calif., June, 1889; specimens in Herb. U. S. and of Calif. Acad. also of Mr. Parish

12 E. HELLERIANA. Large diffusely branched perennial, leafy and floriferous throughout, not seeming dichotomous; herbage glabrous, barely glaucescent: leaves of open dissection, all the segments being very narrow and much divergent, the ultimates a little dilated under the acutish tip: calyx ½ inch long, thin acutely ovoid, with rather short and slender proper apiculation: corolla small for the plant, 1½ inches wide, yellow, and without orange basal spots: filaments short, subulate purple-tipped: stigmas 4, unequal: pods 2½ inches long, stout-

ish; torus under it large, turbinate, the rim quite ample, coriaceous: seeds faintly reticulate.

Type specimens in my herbarium from about Monterey by Mr. Heller, 4 July, 1903, his n. 6860. In Herb. Calif. Acad. there is a sheet of what seems the same, from somewhere in Sonoma Co., no other particulars indicated.

13. E. DOUGLASII, Walp. Rep. i. 116. *Chryseis Douglasii*, Hook. & Arn. Bot. Beech. 320. *E. Californica*, Lindl. Bot. Reg. t. 1168, not of Chamisso. Perennial, glabrous, glaucous, the decumbent stems rather sparingly branched, more than a foot high, sparsely leafy, leaf-segments mostly linear, acutish, notably divergent, the odd leaflet with terminal segment cut deeply into 3 subequal lobes, lateral segments less deeply cut and the lateral lobes or mere teeth much surpassed by the middle one: calyx ovoid, ½ inch long exclusive of the abrupt short slender apiculation: corolla orange, 1½ to 2 inches broad: stamens yellow: stigmas short, only moderately unequal: pod 2½ inches long or more, torus-rim under it remarkably narrow and inconspicuous, even the turbinate torus small for this group: seeds not seen.

Inland plains and hillsides of southern Oregon; first collected by Douglas on the sources of the Multnomah River, now known as the Willamette, the most typical specimens of comparatively recent gathering and distribution being those of Mr. Howell from the Umpqua Valley, April, 1881. From further northward, namely, near Salem, there are good specimens in my herbarium gathered by Mr. Cusick in 1887. To the valley of the Columbia I do not trace in the herbaria the plant here defined, though it may exist there, either as indigenous or as introduced. That it should occur even in northern California as indigenous, no one will think probable who knows the breadth of that elevated mountain barrier, the Siskiyou Range, that separates between two floras so nearly distinct as those of the Shasta Valley in California and of the Willamette Valley in Oregon.

E. Douglasii, as communicated by means of seeds gathered

by Douglas, was the first member of the genus to appear in the gardens of Europe, where for a long time it was generally thought of as the same plant originally described by Chamisso as *E. Californica.* It was several times figured in illustrated works under that name, and even the seeds of it were distributed by gardeners and seedsmen, far and wide, as they still in our day continue to be distributed under that mistaken appellation. Even in Californian flower gardens one may see beds of Eschscholtzia showing corollas white, cream-color, pink, even rose-purple and other red shades, the seeds of which were all imported from Europe, the plants for the most part showing the characters of *E. Douglasii,* though perhaps now and then a trace of admixture with *E. crocea*, this also very early introduced into Europe, but as I suppose, now lost, or mixed with others by hybridization.

Among garden specimens seen in herbaria, none is more interesting than a sheet in the Canadian Geol. Survey of plants taken from a garden in Belleville, Ontario, almost forty years since, by Mr. John Macoun. In all probability these plants were from seeds grown in England, and that within thirty years after the introduction of the species into that country by Douglas. They match native Oregonian specimens as perfectly as one could wish.

Concerning a specimen from far down on the Mexican territory of Lower California, collected by Mr. Brandegee at San Pablo in 1889 and preserved in Herb. Calif. Acad., it need only be said that the manner of its introduction there, whether by flower garden seeds, or accident in seeds of grain or hay from Oregon, is altogether unknown. Mr. Brandegee reports that the plants grew along an irrigating ditch.

14 E. COLUMBIANA. Perennial, glaucous, not quite glabrous, the dilated bases of the petioles commonly scabrous-edged, the decumbent stems a foot or two long, branching and leafy : segments of basal and early leaves long, narrowly linear acute,

little divergent, the dissection of some rameal summer foliage notably different, the segments being short, the outer two of each ultimate three convergent: calyx very thin, subconic-ovoid, ¾ inch long, tapering to a short not slender point: corolla orange, widely expanding, 2 inches broad: stamens with rather long and slender linear-subulate purple-tipped filaments: stigmas 4 unequal: pods 2½ inches long; torus under them large, almost salverform, the coriaceous outer rim conspicuous, more than ⅛ inch wide: seeds not quite spherical, one end mucronate, lightly reticulate.

Species of the region of the lower Columbia River in Washington and Oregon; well represented in Herb. Calif. Acad., Herb. Field Museum, and in my own collection as distributed by Mr. Suksdorf from his gatherings of 1881, the specimens taken in summer, apparently. There is also a good representation of it in U. S. Herb. collected in 1903 at Lower Albina, a suburb of Portland, by Mr. E. P. Sheldon, the corollas in these not wholly orange, the petals being yellow above the middle. These were taken in early June.

On account of its differently shaped and larger calyx as well as conspicuous torus-rim, it is necessary to segregate this from *E. Douglasii.* Its habitat, be it also noted, is that of a district not far from the sea, not much above that level, whereas *E. Douglasii*, of the sources of the Willamette, belongs to a mountainous region of considerable elevation.

In evidence of this plant's having established itself in at least one locality remote from the Columbia Valley, there is a specimen in Herb. Calif. Acad. from the Shasta Valley in northern California, taken by Mrs. Curran in 1887, at Edgewood, a station on the line of the railway between Portland and San Francisco. From the native *Eschscholtzia* of the Shasta Valley this differs so widely that none but a novice could confuse the two.

15. E. Biolettii. Perennial, rigid, suberect, branched from the base, a foot high or more, glabrous, glaucous: leaves on rather slender petioles, rather compact, both the divisions and sub-

divisions somewhat closely approximate, the ultimate segments linear, tapering slightly at apex, yet blunt rather than acute: calyx thin, $\frac{3}{4}$ inch long, ovoid, acuminate: corolla apparently orange, $1\frac{1}{2}$ or 2 inches broad: stigmas several, 4 prominent and unequal supplemented by about as many very short ones: pod stout, $1\frac{1}{2}$ inches long; torus under it turbinate and short, with broad but thin spreading or deflexed rim: seeds not known.

Hetch-Hetchy Valley, in the Sierra Nevada, Calif. F. T. Bioletti, June, 1900. The type specimen is in Herb. Calif. Acad. Its leaves, torus and stigmas preclude my referring it to any known species; and it is from a locality at once elevated and greatly isolated.

16. E. MARCIDA. Perennial, the several rigid and sparsely leafy stems stoutish, partly upright, partly ascending, 1 to 2 feet high; herbage glaucous, glabrous, or the petioles with few and remote small teeth: leaves small, the basal on very long petioles; segments linear and cuneate-linear, not numerous, little divergent, acute; calyx firm, hardly opaque, nearly spherical, or at most only very roundish ovoid, always with an abrupt stout yet evidently tapering point: corolla orange, only an inch wide: stamens many, with short filaments cohering and also the petals adherent to the filaments, the whole falling away together: stigmas 4, all short and stout but unequal: peduncles short and stout, but pods more than 2 inches long and rather slender; torus under them small and nearly turbinate, with well developed but not broad coriaceous rim: seeds unknown.

Var. MONTICOLA. Smaller than the type, with every similar habit and foliage, but petioles quite scabrous-ciliolate: calyx less rounded and larger, but with like abrupt taper-point: petals and stamens not cohering: pod larger; torres scarcely different.

The type of this interesting plant is from Knoxville, Napa Co., Calif. by C. F. Baker, May, 1903. When the specimen now in my herbarium was sent me for identification I called it a form of *E. Douglasii*, and Mr. Baker has so distributed it; but it is now found entirely distinct, by its very different foliage,

round subulate-pointed calyx, and the peculiar persistency of corolla and stamens in a bunch together after flowering. Not that these remain attached to the torus. They are mostly found at a point a little above the middle of the full-grown ovary or pod.

The variety *monticola* is from Monterey Co., the Santa Lucia Mountains, by Miss Eastwood in May, 1897. The habitat is so far removed from that of the type, and comes from the midst of a flora so very unlike that of the country north of Mt. St. Helena, that I can hardly doubt its coming into specific rank later, when the seeds of the two become known.

17. E. SHASTENSIS. Perennial, stouter than *E. Douglasii*, the stems 1½ feet high, less depressed, apparently decumbent only; herbage glabrous, glaucous but not strongly so: segmentation of foliage much broader than in *E. Douglasii*, oblong-linear and linear-cuneiform, obtuse, the lateral two of the ultimate three both longer and narrower than the middle one, this very obtuse, or truncate, or even retuse, commonly mucronulate: peduncles short, little surpassing the rameal leaves: calyx ¾ inch long, ovoid, abruptly apiculate: corolla golden yellow, 2 inches broad: pods 2 inches long: torus exactly funnelform, the rim wholly inconspicuous, hardly surpassing the inner margin: seeds unknown.

Stillwater, Shasta Co., Calif. 21 May, 1894, M. S. Baker and Frank Nutting. Exceedingly well marked species by its leaf-segmentation and denudate torus; apparently only once collected. But Shasta is one of quite a number of Californian counties, each as large as a state, that remain almost unexplored.

18. E. YAINACENSIS. Low perennial, stoutish, sometimes subacaulescent, amply leafy, 6 to 10 inches high, glaucescent, rarely glabrous throughout, usually scabrous-denticulate as to the petioles and lower parts of foliage: long linear leaf-segments little divergent, the middle one of the ultimate 3 hardly surpassing the others but widening upwards, apt to be cuspidately

acute, the others obtusish: calyx thinnish, ¾ inch long, the ovoid body with a stout taper-point: corolla not large, 1½ inches wide, orange-color: stamens many, with slender-subulate filaments: stigmas 4, unequal: torus tubular-funnelform, with but narrow and thinnish reflexed rim.

Species of the lava beds of southeastern Oregon and northeastern California, known only in flowering specimens collected in 1893, partly by Mrs. Austin on the Yainax Indian Reservation, and by Mr. M. S. Baker in Modoc Co. Calif.

19. E. APICULATA. Stoutish low perennial, the decumbent or ascending branches 6 to 10 inches high, sparingly leafy except at base; herbage somewhat glaucous, glabrous except as to the manifestly scabrous-ciliolate petioles of all the leaves; segments of the last rather broad and little divergent, even somewhat overlapping, the ultimates apt to be spatulate-oblong and acutish: calyx of almost exactly ovate outline abruptly and rather stoutly pointed, the apiculation of half the length of the body, the whole rather more than ½ inch long: corolla light-orange, 1¼ or 1½ inches broad, rather widely expanding; stamens indefinite, the filaments yellow, linear, as long as the anthers: pods large for the plant, 2½ inches long; torus under them short and subcampanulate, showing a manifest inner hyaline nerveless margin and a distinct not broad outer rim.

Gravelly places along the streams near Kelseyville, Lake Co., Calif., C. F. Baker, 9 May, 1903; type in my herbarium, under Mr. Baker's n. 3088.

20. E. GRANULATA. Rather low decumbent perennial, quite copiously leafy, glaucescent, the petioles and branches not only on the angles but upon the whole surface roughened with a minute crystalline-granular indument: dissection of leaves somewhat open, the ultimate segments spatulate-oblong and oblong, acutish: earlier peduncles scapiform, stout, sharply angular and striate, 3 or 4 inches high and equalling the foliage: calyx thin, ovate-oblong, abruptly very short-apiculate, 7 or 8

lines long: campanulate corolla about 1½ inches wide, deep-yellow: stamens many, with short liguliform filaments blackish above the middle: stigmas 4, unequal: pods stout, 2½ inches long; torus-rim thickish, narrow: seeds not seen.

Fields and waysides about Stanford University, California, 1 Dec. 1901, C. F. Baker, n. 174, the type in my herbarium; also in U. S. Herb. under the same number, and both under the name of *E. ambigua*. The printed labels say, "These specimens are typical *ambigua*," a pronouncement which I dare say was made by my authorization; but it is a serious mistake, none the less. This and *E. ambigua* are not closely allied. In habit, foliage, pubescence, etc., they are widely different; and I must have given that determination of this plant without comparing it with true *ambigua*.

In Herb. Calif. Acad. are two sheets from La Honda, not far distant from Mr. Baker's locality, though on the other side of the coast hills, by Mr. Brandegee, which have the minute granular roughness of this species, but a broader torus-rim. From Santa Clara Co., in the same region, Mr. Heller has distributed what may also be another state of the same new species, a plant with but faint traces of the roughness on petioles. It is his n. 7501, as in U. S. Herb., and with him purports to be "*E. glauca*, Greene," strangely.

21. E. STRICTA. Perennial, with multicipitous crown of the root supporting many slender and somewhat wiry very erect purple stems a foot high, these sparingly or not at all branched and sparsely leafy; petioles of basal leaves long, slender, erect, their margins remotely and minutely scabrous-denticulate, the plant otherwise glabrous, glaucous: leaves small, with rather few acutish segments all linear, little divergent: calyx ½ inch long, subconic-ovoid with short and small apiculation, in texture extremely thin, or at least wholly yellow just before falling: corolla golden-yellow, well expanded, 1½ inches wide: stamens many, with long anthers on short broadly subulate filaments: stigmas 4, only slightly unequal: pods small and

slender, only 1¼ inches long; torus almost cylindric though short, its deflexed outer rim and erect inner margin of about equal depth.

The type of this is one fine specimen in Herb. Calif. Acad., collected on Snow Mountain, Lake Co., Calif., 22 June, 1891, by Mr. Brandegee.

22. E. LEPTANDRA, Greene, Pitt. i, 170. Perennial, the one or more stout scarcely striate stems a foot high or more, firmly erect, only somewhat paniculately branched, floriferous mainly above the middle, glabrous, very glaucous: leaves not large, nor their segments many, these little divergent, the ultimate threes nearly equal but the middle one broader, all abruptly acutish: calyx firm and opaque, ovoid, short-apiculate, the whole about ½ inch long: corolla 1½ inches broad, lemon-yellow with orange, spot at base of petals: anthers very long; the filaments short, slender-subulate: rigid pods about 3 inches long; outer torus-rim reduced and turgid, inner margin about as prominent, erect and strongly nerved: seeds rather large, spherical or slightly elongated, covered with an olive-green thin coat and a not very definitely favose reticulation.

Confined to the desert regions of northwestern Nevada and adjacent eastern California, first collected by Mr. Sonne at Verdi, subsequently at other stations in the same region by M. E. Jones and T. S. Brandegee, also by the latter at Milford, across the boundary of California, in Lassen County.

23. E. CONFINIS. Size and general habit of the last, though more freely branching and profusely flowering; herbage equally glaucous, but petioles and petiolules remotely and obsoletely scabrous-denticulate on the margin: segments of foliage linear, acutish: calyx thin and diaphanous, round-ovoid, little more than ¼ inch long, very abruptly and briefly apiculate: corolla (late summer specimens) ¾ inch broad, orange-color; stamens long in proportion, half-equalling the petals: stigmas 4, very short, unequal: pod 1½ inches long, torus under it with narrow

and thinnish rim not more conspicuous than the strongly 10-nerved inner margin: seeds spherical, greenish with trace of obscure indument and not very definitely favose-reticulate.

Species of the interior valley of extreme northern California; my best specimen collected at Klamathon, 2 July, 1903, by E. B. Copeland, what purports to be the same having been distributed by C. F. Baker, under n. 3532, though no specimen equalling, or approaching my type, as to completeness, has been seen by me. I also had it many years since, from the same region, through Miss Edmonds, and from her specimens I am able to describe the seeds.

Allied to *E. leptandra*, and while from the same latitude, they belong to two most distinct climatic regions, and are supported by many characters. I refer here with doubt, a plant with buds less rounded, from one of the more elevated parts of the same region, by H. E. Brown, from the slopes of Mt. Shasta, 1897.

24. E. XYLORRHIZA. Slender and rather small perennial, the many stems barely a foot high arising from the stout branched and subligneous crown of a deep root: herbage very glaucous, the margins of the petioles and petiolules coarsely scabrous-ciliolate, the plant otherwise glabrous: leaves rather small, their segments few and not much diverging, the ultimates with middle lobe much longest, all acutish: buds oval, ⅓ inch long, obtuse, very short-pointed: corollas evidently deep-yellow or orange not widely expanding, ½ inch broad or more: stamens many: stigmas 2 only and short: pods 1½ inches long, rigid and striate: outer torus-rim closely deflexed in maturity, exposing the almost, equally conspicuous inner one: seeds not seen.

Snow Mountain, Lake Co., Calif., 25 Aug., 1893, Brandegee; specimens on sheet 2493, Herb. Calif. Acad., also n. 82868. Herb. Field Mus.; a very interesting species, of which one would like to see the seeds; and they must have been collected, as the specimens are mature.

25. E. ANGULARIS. Perennial, the tufted stems not very stout but rigid, suberect, 1 to 2 feet high, all with several more

than usually sharp and prominent whitish angles, the whole plant glabrous: very glaucous, leaf as a whole open, the divisions spreading and separated from each other by a marked interval, but themselves cut into rather closely approximate linear acute segments: calyx an inch long, narrowly almost conical, tapering gradually from a little above the base to the apex, the apiculation scarcely differentiated: corolla of summer flowers (the earlier unknown) 1½ inches broad, the merely cuneate-obovate petals scarcely meeting at their margins: stamens many, on short subulate purple-tipped filaments: stigmas 4, unequal: pods 2½ inches long, not stout; torus under them short-tubular, with conspicuous though not wide coriaceous rim,: seeds not known.

This fine species, well marked in this group by its long slender buds, is based on two sheets in U. S. Herb. from Round Valley, Mendocino Co., Calif., by Mr. V. K. Chesnut; one gathered there in 1897, the other in 1898; fragments of what may be the same species, however, in the same herbarium, from Applegate, Placer Co., June, 1899, by Mrs. Helen Smith; this locality not far removed from the other, though of less altitude.

26. E. ABSINTHIIFOLIA. Perennial, glabrous throughout and very glaucous, 1½ to 2 feet high, branched from the base or near it: leaves little dissected, the cuneiform divisions not broad, the segments all broadly linear, acute, moderately divergent: peduncles long and slender, the flowers small for the plant: calyx opaque, ½ inch long, ovoid or round-ovoid with somewhat abrupt rather short apiculation: corolla golden-yellow, about 1 inch broad: stamens very many, filaments of the outer series not only short, and triangular-subulate but apparently connate at the very base, the inner narrower and longer: stigmas 4, two longer and stout, two very short and slender: pods about 2½ inches long; torus under them tubular-funnelform, the rim well developed but thinnish: seeds not seen.

Taking the place, in the more northerly part of southern California, which its ally, *E. confinis*, holds at the North, the species is typical on sheet 466,007 in U. S. Herb. as collected in

Ventura County, by A. D. E. Elmer in 1902. It is remarkable for the uniformly considerable breadth of its leaf-segments and the small number of them. Quite the same, I think, are two sheets in my own herbarium grown at Biltmore, in North Carolina, in 1898, from seeds that came from the interior of Monterey Co., which specimens were sent me by Mr. Beadle for identification. At that time holding, as in my books, the opinion that all these very glaucous and small-flowered perennials of the interior of California were forms of *E. Douglasii*, I returned that name to Mr. Beadle, who now informs me that he distributed specimens from his garden, under that name. There is also in my collection a good sheet communicated to me years since by Mr. Lemmon. These specimens were gathered by himself somewhere in San Luis Obispo Co. in 1887. In these the cut of the foliage is the same, though the ultimate segments are much narrower; and it may possibly turn out that even *E. absinthiifolia* is an aggregate. It is unfortunate that no seeds of the plant are to be found in the herbaria.

27. E. NITROPHILA. Perennial, with firmly erect but not stout branches, these sparingly leafy and sparsely flowering, 8 to 18 inches high, herbage glabrous, very glaucous: leaves small, narrow and compact showing very narrow sinuses or none between the linear and linear-cuneiform acute segments: calyx ½ inch long or more, thin, ovoid, abruptly short-pointed: torus-rim at flowering time and before thin, whitish, almost translucent, afterwards becoming subcoriaceous under the pods, but still whitish: corolla orange, widely expanding, 1 to 1½ inches wide: pods 2 inches long or more: seeds unknown.

An elegant, though not showy species, collected only by Mr. Parish, the locality alkaline flats in Bear Valley of the San Bernardino Mountains, at an altitude of 2000 feet or somewhat less. The thin torus-rim, at first white and almost hyaline, is an excellent character; and the foliage in some specimens is almost white with bloom.

28. E. PROCERA. Perennial, erect, stoutish, 2 to 3 feet high, the branches rather few and slender; herbage glabrous, glaucous; petioles of longest basal leaves often 5 to 7 inches long; the blade of few long, little divergent, mainly linear segments, but the ultimates spatulate-linear, at the otherwise obtuse apex very distinctly mucronulate: calyx little more than ½ inch long, ovate-conical with very short taper point: corolla small for the plant, hardly 1½ inches wide, yellow: pods slender, 3 inches long or more; torus under them short-funnelform, with quite narrow coriaceous deflexed rim.

Foothills of the Sierra Nevada, at an altitude of about 2500 feet, southward, near Kernville, Calif., 13 May, 1891, T. S. Brandegee; the types two good sheets in Herb. Calif. Acad.

29. E. CROCEA, Benth. Trans. Hort. Soc. 2 Ser. i. 407, Lindl. Bot. Reg. t. 1677; Greene, Fl. Fr. 285, and Man. 11. Stoutish, upright, a foot high more or less, sparingly branched and few-flowered; herbage glabrous, scarcely glaucescent, leaves copious and large, mostly from the base and long-petioled, their very numerous segments nearly linear, the larger ultimates dilated upwards, all acutish: calyx long-conical, 1 to 1¼ inches long, rather opaque: deep-orange petals 1½ to 2 inches long, never widely expanding: filaments short, blackish except at base: stigmas 4, unequal, neither pair very long: torus-rim ½ to ¾ inch broad: pods large and stout, commonly 3 or 4 inches long; seeds large, spherical, rather lightly favose-reticulate.

Var. LONGISSIMA. Taller than the type, less robust: calyx slender-conical, but ending in a distinct terete apiculation more than ½ inch long, the whole calyptra 2 inches long: orange corolla not large in proportion.

Var. APIIFOLIA. Stout as the type, corollas as large; calyx not seen: herbage more glaucescent; segments of the leaves altogether broader, oblong and oblong-linear, acutish, more divergent.

Typical *E. crocea* is at home only among the valleys and hillsides of the coast ranges of mountains in middle California,

where it abounds, and is altogether the most gorgeous of Eschscholtzias. It is not a large plant, though displaying almost the largest corollas. Neither is it a long enduring perennial; rather, often merely biennial; nor does it present, as do most of the species, at first a single flower on a scapiform peduncle. It is obviously branched at first flowering, though never branching freely.

Outside the geographical limits above noted are plants in plenty which approach it more or less closely in habit, and in size and color of corolla. Some of the extremes of these are here named and described as varieties. The one denominated *longissima* I know only as in Herb. Calif. Acad. said to have been collected somewhere in Colusa Co., by Mr. Brandegee, in April, 1889. The variety *apiifolia* is imperfectly known to me by two sheets in U. S. Herb. obtained by Mr. Jepson at Vacaville, March, 1892. Each specimen has a solitary flower, but no well grown buds even. Its locality is extralimital for real *E. crocea*, and I think it may be found worthy of specific rank when better known.

30. E. MACRANTHA. Perennial, 1 to 2 feet high, with stout upright branches but delicately dissected foliage, the segments long, almost parallel, cuneate-linear, acutish; plant glabrous, glaucescent or glaucous, never much branched, bearing few long-peduncled very large flowers: calyx very thin and diaphanous, somewhat ovate or oblong-conical, acuminate rather than abruptly apiculate, the whole 1¼ or 1½ inches long, and apt to be persistent under the open corolla, on one side: corolla apparently deep yellow or almost orange, the petals 1½ to 3 inches long, the largest flowers with an expansion of 4 or 5 inches: torus-rim evident, but narrow and inconspicuous compared with that of other large-flowered species.

There are two sheets of this before me, one in my own herbarium from near Visalia, Calf., by Dr. T. J. Patterson, March, 1886. In this the calyx persists like an empty horn or spur, at full flowering. The other specimen, with corolla in the dried

state, in the herbarium, that measures 5¼ inches across, is from Ione by Mr. or Mrs. Brandegee, April, 1889. The three specimens are, therefore, from one and the same general geographic and climatic region.

31. E. SANCTARUM. Akin to *E. crocea*, much larger, often 2 or 3 feet high, more loosely leafy and branching, and with long-peduncled less richly orange-colored corollas, the herbage slightly more glaucescent: calyx as large, 1½ inches long, the ovate-conic body surmounted by a distinct stout-apiculation of half its length: corolla more widely expanding, the largest 2 inches long: torus-rim mostly less than ½ inch wide: pods stout and subligneous, 2 to 3 inches long: seeds unknown.

South Californian homologue of the middle Californian *E. crocea*; its marks as a species already indicated, and sufficing to preclude our treating it as a possible *E. crocea* introduced from the very different region five hundred miles to the northward. The specimens are, first, and for flowers and buds the best, a sheet in my own herbarium distributed from the Grand Mesa, San Diego Co., where it was collected in May, 1894. In U. S. Herb. are two sheets obtained in the same region, namely at Santa Ysabel by Mr. H. W. Henshaw, April 1893; in Herb. Calif. Acad. two sheets of mature specimens from the Santa Ynez Mountains back of Santa Barbara, by Mr. Brandegee as early as 1888.

The sole specimen before me of *E. crocea*, var. *longissima*, bears some likeness to these plants of the South, at least, in the matter of its long calyx. But there are other differences; and especially the fact the two belong to really different, and very different, climatic regions; are members of two rather distinct floras.

32. E. SCARIOSA. Perennial, with the habit of *E. crocea*, but smaller, more robust, with smaller orange corollas: foliage less ample, the linear segments less divergent: calyx ¾ inch long, with abrupt short apiculation; stigmas 8 or 10, nearly equal;

torus inflated and scarious-looking, the epiderm being loosened and becoming bladdery; rim not broad, thinnish, reflexed; inner margin hyaline and denticulate.

Carrizo Plains, east of the mountains, in San Luis Obispo Co., Calif., 3 May, 1896, also on Caliente Creek, 7 May, and at Santa Maria, 10 May, all in the same general region the same year, by Miss Alice Eastwood. Species remarkable for the great number of stigmas, all equally developed. The scarious torus is a character marking two other species, but these in the other section of the genus.

33. E. RIGIDA. Robust and rigid upright branching perennial 2 or 3 feet high, glabrous throughout, glaucescent, sparsely leafy and leaves small for the plant, firm, their segments obovate-cuneiform or oblong-cuneiform, acute, little divergent: peduncles short, mostly in the forks of obviously dichotomous branches, very stout: calyx nearly 1 inch long, subconic-ovoid, abruptly short-pointed: corolla orange, not large for the plant, very open-campanulate and 2 inches wide or less: stamens indefinite, with short filaments and long anthers: stigmas 4, very unequal; pods small for the plant, only 1¼ to 2½ inches long; torus very long and narrow, tubular funnelform, often ½ inch long, the coriaceous deflexed rim not very broad, the inner margin papery and opaque: seeds short-ovoid rather than spherical, strongly rugose transversely, the papery ridges sometimes running into an irregular reticulation.

The earliest specimens of this southern mountain species are some branches in fruit collected by myself at Tehachapi, California, 21 May, 1885. Otherwise the type is Coville & Funston's n. 1115 of the Death Valley Expedition, obtained in the same vicinity in 1891, and catalogued on my authority as *E. crocea*, from which it is easily most distinct, and which, in distribution does not approach this Tehachapi region.

I refer here with reluctance plants that have been collected by Mr. Parish at Fort Tejon, at Banning, in the San Bernardino Mountains, and at San Gorgonio Pass, all of them differing

from *E. crocea* in being robust, rigid and branching and with smaller flowers, but exhibiting a shorter torus with broader rim than are seen in true *E. rigida ;* nor are they of more than half the height of the typical plant so named. Nevertheless, some old fragments by Xantus, from somewhere not far from Fort Tejon, preserved in U. S. Herb. appear to be of the genuine *E. rigida.*

34. E. RECTA. Perennial, stem the first year solitary, afterwards several from the root, always rigidly erect, very stout, sparingly and fastigiately branched, 2 feet high, below the branching thick, subterete but strongly marked by from 5 to 9 prominent whitish lines or angles: herbage glabrous, glaucous: leaves large, cut into many linear and very sligtly divergent segments, all acute except the middle one of each ultimate three, this always longer than the laterals, commonly dilated upward and obtuse: buds and flowers small for the plant; calyx ¾ inch long, with ovoid body and rather abrupt long and stoutish apiculation: corolla golden-yellow if not even orange, 1½ to 2 inches broad in wide expansion: pod nearly 3 inches, stoutish, torus under it long and tubular-funnelform, with prominent not broad rim: seeds large, spheroidal, dark-colored, marked with a definite rather small reticulation.

A rank middle Californian species of the plains of the interior as well as of the foothills bordering on them. It has formed a part of the *E. Douglasii* of my books, and I have sometimes authorized that name for specimens to be distributed. In its orange-colored condition of flower it is more likely to pass for *E. crocea.* The best specimens for foliage and flower, as well as for the rigidly erect habit, are Mr. Baker's n. 2921 from near Elmira in the Sacramento Valley. His specimen of that as found in my herbarium I would name as the type, apprehending, as I do, a possibility that my *E. recta* of this paragraph may in the future be proven an aggregate. The seeds are, however, described from a sheet in Herb. Calif. Acad. collected at Antioch, by Mr. or Mrs. Brandegee in 1889. It is

the only specimen furnishing seeds; and Antioch and Elmira are both in the same geographic and floral district, at least in a general way. As representations of the species from the foot-hills of the Sierra, I may name a sheet in my own herbarium from Cow Creek, Shasta Co., by Baker and Nutting, 1894; also one from Knight's Ferry, Stanislaus, Co., 9 April, 1895, by F. W. Bancroft. In U. S. Herb. a sheet from Amador Co., by Mr. Hansen, 1895, his n. 1112, and one from Sherlocks, Mariposa Co., 24 May, 1893 by J. W. Congdon. There is a specimen in Herb. Calif. Acad. from Grant's Pass, southern Oregon, which I refer here. It was collected by Mr. Howell, 23 May, 1884. From its being on the wrong side of that great natural barrier, the Siskiyou Mountains, I suspect it of having been introduced there accidentally from its proper habitat. There is, lastly, a sheet of it in Herb. Canad. Geol. Surv. from Beacon Hill, Vancouver Island, B. C., collected by Mr. Macoun in 1893, the label bearing this instructive note, "Introduced, but naturalized."

35. E. CALOSPERMA. Perennial, of the size and nearly the habit of *E. recta*, but branched from toward the base, the stem and branches only faintly striate, the large leaves with similar linear acute little divergent segments: calyx ¾ inch long, narrow and acute-conical: corolla golden-yellow, 1½ or two inches broad: pod about three inches long, stout, curved; torus under it short-funnelform, with very broad coriaceous rim ascending rather than either spreading or deflexed: seeds large, rather acutely ovoid, of a grayish or olive-green hue by a dense somewhat lepidote coat, and favose-reticulate, one side being marked from end to end by the narrow black line of the raphe which alone is not coated, the sharp end of the seed mucronulate-apiculate.

Hills of Monterey Co., between Kings' and Jolon, 7 June, 1893, Miss Eastwood; type in Herb. Calif. Acad. Readily distinguished from *E. recta* by the large peculiar torus, and from that and all others by the elegant somewhat sea-shell-like seeds,

36. E. REVOLUTA. Stout and low, only 6 or 8 inches high, including the corollas, these borne on scapiform peduncles quite surpassing all foliage; root-crown or caudex often multicipitous, the plant therefore a strong perennial: herbage glabrous, glaucescent: leaves compact, their segments broad and little divergent, the ultimates oblong-cuneiform, the middle one of the 3 broadest, all abruptly and somewhat cuspidately acute: calyx thin, an inch long or more, oblong-conical, but with actual apiculation quite distinct and not short: corolla orange, more than 2 inches broad in expansion: stamens many; filaments chiefly dark-colored: stigmas 4, very long, subequal: torus short, turbinate, with ample but thin rim appearing small by being rather closely revolute even under the flowers and buds.

Known only as collected by me in the Livermore Valley, Calif., 3 April, 1895. It is abundant on sterile gravelly flats.

37. E. FLORIBUNDA. Stout low subacaulescent perennial, with numerous upright leaves and scapiform peduncles 6 or 8 inches high from a branching root-crown or candex; herbage merely glaucescent; margins of petioles scabrous-denticulate or smooth, all other parts glabrous: leaves compact, their oblong-linear segments little divergent, acutish: calyx thin, 1 to 1½ inches long, oblong-conical, ending in a terete apiculation 1 to 1½ lines long: stamens many, the anthers very long and slender, on short subulate purple-tipped filaments: stigmas 4, long, slightly unequal: pods nearly 3 inches long, slender and straight; torus long and narrow funnelform, with rim pronounced but not broad, the inner margin short, strongly nerved: seeds unknown.

Var. GORGONICA. Decidedly glaucous, more distinctly scabrous denticulate: calyx more gradually pointed and the point longer in proportion; torus rather turbinate than funnelform.

Type from near Santa Ysabel, southern California, 15 May, 1893, H. W. Henshaw, in U. S. Herb.; plant probably from a considerable elevation in the mountains.

The variety is from San Gorgonio, Pass in the same region,

by J. B. Leiberg, 5 April, 1898. This locality has an elevation of nearly 3000 feet. The plant is comparatively few-flowered, and may well prove eventually, to be species.

38 E. BRANDEGEI. Multicipitous low perennial, the scapiform and slender peduncles 4 to 6 inches high, overtopping all the foliage; herbage glaucous, also the petioles and angles of the stem more or less definitely scabrous: leaf-segments narrowly linear, acute, slightly divergent: calyx thin, about ½ inch long, acutely ovoid, with distinct very short and slender apiculation: corolla apparently orange, 1½ inches broad or less: stigmas 4, very slender and very unequal: torus narrow-turbinate, the thin rim deflexed, not wider than the scarious inner margin, this conspicuous.

From some unmentioned locality, near Lakeport, Calif., April, 1889, Mr. or Mrs. Brandegee. Type in Herb. Calif. Acad., on sheet n. 2616, along with two other species, one perennial, the other annual.

39. E. CLEVELANDI. Diffusely dichotomous maritime annual, often forming a loose mat 2 feet wide, glabrous, or with some minute and obscure roughness on branches and petioles, glaucescent rather than glaucous; leaves and flowers small; segments of leaves either broad, short and divergent, or narrower, longer and almost parallel on the same plant: calyx oblong-conical, about ½ inch long, thin and translucent, the very short apiculation blunt: corolla nearly rotate, 1½ inches broad, early and sparse flowers and yellow, later smaller, deeper yellow or orange: stamens many, the filaments very short and stout, purple above, the anthers linear, elongated: stigmas 4, slender, unequal: pod slender, 1½ inches long; torus under it small, but with the spreading rim conspicuous: seeds small, not quite spherical, apiculate at one end, reticulate.

Abundant at and near San Diego, Calif., along the seashore, thence southward apparently to Ensenada on the peninsula of Lower California; also on Coronados Islands; being a southern homologue of the perennial *E. Californica*, but

very seldom if ever of more than annual duration. Well marked also by its small golden-yellow or almost orange corollas, and especially by its conical calyx of thin texture.

In its early spring state, with few flowers, one on a long and scapiform peduncle, it is seldom collected. I find it only on sheet 14,050 of Herb. Calif. Acad. The collector, Miss Eastwood, gives no date for this interesting stage of its flowering, which, as far south as San Diego must be very early.

E. Clevelandi is not to be confused with another annual, belonging to the uplands about San Diego, which is a separate affair, once referred by me, erroneously, to *E. peninsularis.*

40. E. AUSTRALIS. Allied to *E. Clevelandi,* apparently as large and as widely spreading but with comparatively few leaves, the stout branches largely naked, with smallish leaves rather more glaucous: calyx very different, ovate-conical, and with a distinct and not short apiculation; torus both larger and with broader rim: corolla the same as in *E. Clevelandi:* pod and seeds not seen.

Confined to shores of the Lower Californian peninsula below Ensenada, the type from San Quentin by Dr. Edward Palmer, on sheet n. 2534 Herb. Calif. Acad.

41. E. BICORNUTA. Annual, with many ascending branches from the base all about foot high and with obvious false dichotomy as to the many secondary branches and peduncles; herbage glabrous; the stems and branches unusually smooth and free from angles or striæ; leaves small, of few and little divergent linear segments: calyx thin, ½ inch long or less, broadly and sharply ovate-conical; corolla yellow, less than 1 inch broad, apparently almost rotate: stamens few, with short filaments: pods unknown, but growing ovaries showing the two longer of the four stigmas with bases accrescent after flowering, becoming thick-subulate, and standing out divaricately from each other, or slightly recurved, thus persistent like a pair of by no means

slender horns: torus small, turbinate, with reduced but visible cartilaginous ring in place of rim: seeds spherical, reticulate.

Very singular species, from San Sebastian, Mexican province of Lower California, collected by Mr. Brandegee, 28 April, 1889, the type in Herb. Calif. Acad. The specimen is very mature, only two buds and three corollas remaining, but with many growing ovaries, all showing the singularly accrescent and persistent bases of two of the stigmas. The plant is doubtless not maritime, but an inland or at least upland species.

42. E. MICROLOBA. Annual, branched from the base and strongly decumbent if not more depressed, the branches a foot long or more, remarkably stout but somewhat fistulous, finely striate, sparsely leafy with small foliage and notably false-dichotomous; herbage glabrous, glaucous; leaves of the branches scattered and much reduced, the basal known only by the long and uncommonly slender petioles; segments of the rameal short, linear, moderately divergent: calyx ¼ inch long, firm, ovoid, with very short blunt point: corolla orange, about 1 inch broad: pods very small for the plant, 1 inch long or little more: torus turbinate, with thin deflexed rim and hyaline inner margin of about equal width: seeds short-ovoid, transversely sinuate-rugose rather than reticulate.

Carrizo Plains, interior of Southern California, 12 June, 1902, Alice Eastwood. A strongly marked species, of which the early stages of development are, of course, unknown. The locality is a peculiar one.

43. E. LACERA. Annual, branched from the base and the numerous branches ascending, or almost prostrate, a foot long or more, freely and as if dichotomously branched; leafy and floriferous throughout, glabrous, glaucous: leaves of very open dissection, sharply cut into narrow-linear nearly divaricate primary segments, the ultimate 3 merely divergent, all acute: peduncles short, slender: calyx thin, ½ inch long, subconic-oblong, with abrupt short and minute apiculation: corolla golden-yel-

low, nearly rotate, 1½ inches wide: stamens many, the short filaments lanceolate-subulate, wholly yellow: pods thinnish and nearly straight, scarcely 2 inches long: torus short-funnelform strongly ribbed, outer rim prominent, inner margin less so: seeds small, exactly spherical, elegantly favose-reticulate and minutely dotted.

Sandy soil near, and among the foothills of the Sierra Nevada in Fresno and Kern counties, California; first collected by Dr. Edward Palmer at Kernville, June, 1888; and there is a handsome sheet in U. S. Herb., bearing the legend "Agricultural grounds, Washington, D. C., cult. 1889," which is so clearly identical with the wild original of Dr. Palmer's collecting, that one can not doubt the derivation of these garden specimens from seeds brought by Dr. Palmer the year before; though the herbarium sheets in neither case furnish a seed. But these specimens are the types, except for the account of the seeds. The latter are found preserved with a good specimen taken on sandy ground near Kingsbury, by Mr. T. H. Kearney, 17 June, 1901. Still later, Mr. Cougdon of Mariposa Co., has sent a poor specimen from Copper Mine, Mariposa Co., this of 18 May, 1903. The species is an uncommonly fine one, habit in recalling *E. Cleveiandi* of the San Diego seashore.

44. E. AMBIGUA, Greene, Fl. Fr. 286. Annual, branched from the base, the branches rather slender, strongly decumbent or more depressed, 5 or 6 inches long, the whole forming a loose mat a foot broad or less; herbage glaucescent, mainly glabrous, but margins of petioles and petiolules, sometimes also of growing foliage and young buds, scabrous in lines; leaves small, the segments divergent moderately, the ultimates obovate-cuneiform, cuspidately acute: calyx narrowly ovate, with gradual and not slender point, the whole ½ inch long; corolla golden-yellow, widely expanding, 1 inch wide or more: stamens about 12, the wholly yellow filaments rather long, nearly filiform, anthers much longer: stigmas 4, unequal: pods small, slender, thinnish, 1 inch long or more, the torus under them turbinate, with obvious rim: seeds (immature) spherical, lightly reticulate.

Still known only in the original specimen, described in Fl. Fr. Other plants have been distributed under this name, but always wrongly.

45. E. TENUISECTA, Greene, Pitt. i, 167. Annual, upright, but branched from the base, the outer branches therefore ascending, the whole a foot high or more, glabrous, glaucous: leaves not ample, multifid and the many segments extremely narrow, moderately divergent, the ultimates a little wider under the mostly acute or acutish apex: calyx very thin, subconic-ovate, usually long and slender-pointed: corolla yellow, about 1½ inches wide: stamens many: stigmas very slender and unequal: pods 2 inches long; torus under them with broad and prominent coriaceous rim: seeds exactly spherical, delicately favose-reticulate.

First described from living plants grown from seed brought from near Chico, Butte Co., Calif. A few specimens were gathered the first year (1888) from the garden, and distributed to several correspondents. One of these, communicated to H. N. Patterson, is now in Herb. Field Mus. Others made from the garden the second year (1889) were not true to the type, and are probably hybrids of *E. tenuisecta* with some other species growing in the same bed. These are much stouter plants than this type, more sparingly branched and less glaucous, as well as with a less narrow leaf-dissection.

Good wild specimens from what must be the original station about Chico, were sent out by Heller & Brown under n. 5456 (Herb. Field. Mus.) named *E. hypecoides*.

46. E. COGNATA. Stoutish decumbent annual, 8 or 10 inches high only, including the length of the large pods; several peduncles long and scapiform: herbage glabrous, glaucous: leaves mostly near the bases of the very short branches, not small, finely cut into many long narrow acute segments little divergent: calyx not seen: corolla 1½ inches wide: stigmas 4, not slender, long and nearly equal: pods stoutish, 3 inches long or

less; torus under them with distinct coriaceous but not wide rim: seeds slightly elongated, favose-reticulate.

Known only from some unmentioned station in Colusa Co., where it was collected by Mr. Brandegee, Apr., 1889. One specimen in Herb. Calif. Acad., another in Herb. Parish. The habitat, though not so very far removed from that of *E. tenuisecta* is on the opposite side of the interior valley of California and therefore in another climatic region. The species is most unlike *E. tenuisecta* in habit, and has different stigmas and seeds

47. E. ARVENSIS. *E. compacta,* Greene, Fl. Fr. 285, in part and excl. syn. *E. tenuisecta,* probably not *E. compacta,* Walp. Rather stoutish annual 8 to 16 inches high, branched from the base, ascending or decumbent, moderately leafy, glabrous, glaucescent; leaves cut into narrowly linear or linear-cuneiform acute segments, the ultimate ones deeply and subequally 3-cleft: peduncles stout, several of the earlier scapiform and surpassing the copious foliage; calyx large, oblong-conical, diaphanous, shortly and slenderly apiculate: corolla open campanulate, the earlier ones more than 2 inches broad, deep golden-yellow: filaments many, the outer short and subulate, the inner linear and longer, all dark-purple under the anthers; stigmas very slender and unequal: turbinate torus with rather broad red-purple rim; pods 2 inches long or more: seeds small, short-ovoid, acutish at one end, strongly reticulate.

Var. DILATATA. More upright, even rather strict; ultimate segments of leaves dilated upwards and obtuse, usually mucronulate.

Large and fine annual species, inhabiting the middle sections of the interior valley of California, common along the lower San Joaquin, often abounding in grain fields about Lathrop, Tracy, Byron and apparently in similar situations of the lower Sacramento. Typical *E. arvensis* was distributed by Mr. C. F. Baker, under n. 2778, from Tracy, in 1903. What I have placed as var. *dilatata* seems the more common form, and is in my her-

barium of my own collecting at Lathrop, 29 April, 1889, and from Byron, 10 April, 1892 by Michener and Bioletti. Plants collected by myself at Rocklin near Sacramento, 8 March, 1875, seem to me to represent this variety in its earliest flowering stage in which it would correctly be described as acaulescent, with scapiform peduncles, As for the *Chryseis compacta*, Lindl., its identity, always doubtful to my mind, is now the same; though I think it may not improbably be that which in this paper I name *E. lacera.*

48. E. ISOSTIGMA. Annual, of the size and habit of *E. arvensis*, more leafy, more nearly glaucous, apparently somewhat succulent: leaves more irregularly dissected, the ultimate segments variously unequal and in twos, threes or fives, all oblong-linear, obtuse: full grown calyx not seen: corollas, pods and seeds as in the last; hyaline inner margin of torus rather conspicuous: stigmas 4, all well elongated and almost exactly equal.

Known in but a single specimen, and that in my own herbarium, purporting to have come from among the Montezuma Hills, which extend along the northern shore of the Sacramento River in Solano Co., Calif., the collector, W. L. Jepson, 1892. However much one might wish to connect this with *E. arvensis* as a mere variety, the difference between the two as to the stigmas forbids it; and, though hard to define it, there is a different aspect to the foliage.

49. E. ORCUTIIANA. Habit of the foregoing, but not as large, stoutish, but foliage small and delicately cut, the petioles and rachis slender, all the segments short, narrowly linear, acutish: calyx smaller, thin, slenderly almost conical, yet with evident and not very short apiculation: corolla 1 inch wide, orange-color: torus long and narrow-funnelform, the thin herbaceous rim obvious: pods 1½ or 1¾ inches long.

Type from Salada, in the Mexican Territory of Lower California, C. R. Orcutt, 5 May, 1886, the specimen in Herb.

Field Mus. In U. S. Herb., on sheet 3346 is a specimen by Miss Fink, from Todos Santos Island, that may or may not be the same. It has a somewhat different aspect and a wider torus-rim.

50. E. PICTA. Taller than the last, larger and more lax; herbage fairly glaucous: leaves large with many narrow somewhat spatulate linear segments, the middle one of the ultimate 3 apt to be tridentate: calyx thin, oblong-conical, ¾ inch long, with short apiculation: corolla 1½ inches broad, golden-yellow; torus short-funnelform, the herbaceous broad spreading rim commonly dark-red above: seeds spheroidal, dull-greenish with a close coating of the substance of the favose reticulation.

Apparently common among the hills of the interior of Los Angeles Co., Calif., best represented in herbaria as collected by Mr. Parish in San Francisquito Cañon, June, 1887, and on "hills of red clay south of Santa Ana River, 1 April, 1888." Beautiful samples with ample and almost bright red torus-rim are in Mr. Parish's collection from Elysian Hills, Los Angeles Co., by E. Braunton; Baker's n. 4179 from Claremont is the same in young state.

51. E. BERNARDINA. Stout low decumbent much branched annual 8 or 10 inches high, with small orange corollas and large stout pods; herbage scarcely more than glaucescent; plant copiously leafy everywhere but leaves small, with almost divaricate primary divisions, the segments little divergent, broad, the ultimates oblong-linear, obtuse except for an abrupt and sharp mucro: calyx ½ inch long, subconic-ovoid, very short-pointed, rather opaque; corolla little more than 1 inch wide: stout pods 3 inches long; torus short-funnelform, with wide thick rim: seeds small, spherical, strongly but not very definitely favose-reticulate, i. e. the favose character not very clear.

Edgar Cañon, in the San Bernardino Mountains, Calif., at 3000 feet, S. B. Parish, 13 June, 1894; type in U. S. Herb. sheet n. 214,371, under Mr. Parish's label n. 3139 is my type. Mr. Parish calls it *E. cæspitosa*, as he likewise does another dis-

tribution of somewhat similar specimens from near San Bernardino, and therefore from a much lower altitude and in another natural zone, which, like his n. 4162, and an unnumbered sheet in my herbarium from "San Bernardino, June, 1893," I refer to *E. Bernardina* rather doubtfully.

52. E. DIVERSILOBA. Much branched and very leafy annual, with stout ascending branches from the base, or these possibly more depressed; herbage glabrous, lightly glaucous; leaves with narrow rachis, but all the divisions and segments rather broad, only the later and smaller rameal ones with cuneate-linear segments, those of all the others with spatulate and obovate-oblong ultimates, but all very obtuse, yet ending in a small mucro, some divisions trifid, others very unequally bifid: calyx thin, small, barely ½ inch long, very broadly yet acutely ovoid, hardly apiculate: corolla orange, small, little more than 1 inch broad: torus turbinate, its rim only small and insignificant.

Near Lakeport, Lake Co., Calif., April, 1889, Mr. or Mrs. Brandegee, in Herb. Calif. Acad., sheet n. 2616, already cited as having several species, one of which is *E. Brandegei* (n. 37 of this series).

53. E. THERMOPHILA. Middle-sized or large annual, in maturity often 2 feet high, branched from the base and decumbent, always stoutish, glabrous, glaucescent or even distinctly and emphatically glaucous, very leafy and floriferous throughout, the leaves large, and with broad and divergent divisions, the ultimate segments rather long, oblong-linear, the very terminal one commonly broadly cuneiform and 3-lobed or 3-dentate between two long uncut ones of about its own length: peduncles, except in the early subacaulescent state, not long, little surpassing the leaves: calyx thin, an inch long, almost conical, with short apiculation: corolla 1½ to 2½ inches broad, apparently very widely expanding, yellow or orange: filaments unusually long and slender for the group, almost as long as the anthers, dark-purple at tip: stigmas 4, very long, subequal: pods small for the plant, only 1½ inches long and thinnish:

torus under them quite broad but rather thin, crispid and recurved, under the buds and flowers, only, seen to be quite ample: seeds small for the plant, round-ovoid to almost elliptical and acute, favose-reticulate.

I refer to this species some eight sheets, all from the upper San Joaquin, gathered partly by Mr. Brandegee and partly by Miss Eastwood, all but one of the sheets belonging to Herb. Calif. Acad. One sheet of small very glaucous specimens in the early and acaulescent stage, collected at Caliente, 4 April, 1891, being in Herb. Field Mus. Two sheets bearing precisely the same label are in Herb. Calif. Acad., all with plants of a somewhat later stage of development. Sheet n. 2625 contains a large young plant scarcely glaucescent, and one which had no acaulescent stage; also a small subacaulescent specimen that is glaucous. A large and handsome specimen exactly like this as to being glaucous ocupies sheet 2474. A half-dozen small subacaulescent glaucous specimens from Lerdo, 3 April, 1891, by Mr. Brandegee, occupying sheet 2470, show a different habit, and somewhat dissimilar foliage, so that scarcely believe they are of this species. Sheet 2672, of Miss Eastwood's collecting in March, 1893, has a large specimen from San Emidio in the same region this well branched in copious young flowering; also three small earlier ones from Bakersfield, each with its solitary first flower in its perfectly scapi-like peduncle. Sheet 2603 is occupied by a specimen from Exeter, Tulare Co., by Miss Eastwood, the date 26 April, 1895. All these are glaucous plants, with narrower leaf-dissection and paler flowers than the Caliente types; but the whole assemblage seems to be at agreement in the ultimate segmentation of foliage, characters of calyx, stamens and torus. Nevertheless, when properly investigated in the field, these may come to three if not four good species. My actual types must be the Brandegee specimens, scarcely glaucescent, on sheets of Calif. Acad. 2625 and 2626.

54. E. STRAMINEA. Annual, the many decumbent branches a foot long or more, stout but apparently hollow, of a vivid

green showing in strong contrast the whitish striæ, only sparingly leafy, the secondary branches few, ending in very long naked peduncles; scarcely more than glaucescent, usually glabrous, only the basal parts now and then scabrous; leaves not small, but their segments few, the main divisions cuneiform, parted into long and narrow moderately divergent ultimates all acutish: calyx very thin and translucent, ¾ inch long including the elliptic-ovoid body and slenderly tapering long point; corolla small for the plant, light-yellow: pods slender, very long, 2½ to 3½ inches; torus very small, with rim greatly reduced, hardly more obvious than the inner margin.

At several stations among the foothills of the San Bernardino Mountains, southern California, at an altitude of about 1500 feet, S. B. Parish, who distributed it from Waterman's Cañon, 1 May, 1888, as *E. Mexicana*, Greene, doubtless on my authority; for it is somewhat related to that species, though a much larger plant, and not subacaulescent; but in Herb. Calif. Acad. as well as in my own, certain older and fruiting specimens on the same sheets and under the same label, specially gathered by Mr. Parish doubtless for the purpose of exhibiting fruit and seeds, are *E. vernalis*, as may be seen by their different habit, broad short leaf-segments and short pods, these invariably of no more than half the average length of those of *E. straminea*, which I thus name not so much in allusion to the pale color of the corollas as to the thin and somewhat straw-like hollowness of the striated stems.

55. E. VERNALIS. *E. peninsularis*, Greene, partly, of Bull. Cal. Acad. i. 183. Annual, 6 to 12 inches high, with a tuft of upright basal leaves and 5 to 10 or more rigid and not slender ascending rather sparsely leafy and few-flowered branches, a single central earliest peduncle scapiform and half as high as the proper branches; herbage glabrous, glaucous: small leaves rather compact, their ultimate segment obovate-oblong or oblanceolate, acutish, moderately divergent: calyx thin, oblong-conical, little more than ½ inch long, slenderly and not very shortly apiculate: corolla golden-yellow, about 1½ inches broad,

campanulate: stamens about 16, the filaments short, subulate, black-tipped, anthers long, oblong-linear: stigmas 4, unequal: torus short funnelform, with distinct, if not very wide or conspicuous rim: pod slender, 2 inches long or more.

Smallish upright vernal and short-lived annual of the mesas and hilly uplands of Los Angeles and San Diego Counties, California, flowering and fruiting from the beginning of February to the beginning of the dry season in April, after which the plants are dead and some gone. It was this that I had chiefly in mind when, in 1885, I wrote of *E. peninsularis* as frequent about San Diego; and all the San Diego "*E. peninsularis*" of my collecting and distributing in that year, is of this elegant and abundant plant, equally distinct from the maritime *E. Clevelandi* on one hand and from the true *E. peninsularis* of the mountains of the Lower Californian peninsula on the other. But Mr. Orcutt obtained and distributed from Palm Valley, in N. L. Cal. in 1885, under the name of *E. peninsularis*, what is rather to be referred to *E. vernalis*, though it has a shorter torus with wider rim than the Californian plant.

56. E. PHYSODES. Annual, the several stems not slender, upright from amid a tuft of long-petioled upright basal leaves, 8 to 14 inches high; herbage glabrous, glaucous; leaves with broad petiole and narrow lamina, the segments rather few, little divergent, linear, acute, apt to be purple at tip: calyx ¾ inch long, not very thin, oblong-conical, or rather oval with long and gradual apiculation: corolla rather light-yellow, 1 to 1¼ inches broad, expanding widely: stamens many, with short linear wholly yellow filaments: stigmas 4, slightly unequal: torus acutely turbinate under the flower, but white and scarious-looking, under the pod inflated and bladdery, the outer rim in these obscured, yet manifest, though narrow under the buds and flowers.

Witch Creek, San Diego Co., Calif., April, 1894, R. D. Alderson; the type in my herbarium; the name *E. caespitosa* being given on the label. In the herbarium of Mr. Parish are two specimens from the same place, the same year, and by Mr. Alder-

son, named by him *C. crocea*, which have the same habit, foliage, and glaucous hue, one of which exhibits both a scabrous line up and down one branch, and a similar roughness on the margins of the upper leaves. Neither of these specimens shows distinctly the bladdery state of the torus so notable in mine; so that this character may not be constant.

57. E. PENINSULARIS, Greene, Bull. Calif. Acad. i. 68, but not of p. 183. Annual or possibly perennial, glabrous, glaucescent, freely branching from the base, the slender ascending branches a foot high or more, leafy and floriferous throughout, but foliage small, little dissected, many leaves only biternate, the ultimate segments dilated upwards, abruptly acute: calyx firm and opaque, ovate-conical, ¼ inch long: orange-colored corolla small, open-campanulate, ½ inch broad: stamens definitely 8, the subclavate anthers much longer than the subulate filaments: stigmas 4, nearly equal: torus short, turbinate, with broad and conspicuous spreading rim: pods little more than 1 inch long: seeds manifestly elongated, mucronate at both ends, lightly favose-reticulate.

Mountain districts of northern Lower California, first collected by Mr. Orcutt, at Las Juntas, 3 July, 1884 and distributed by him under n. 1095; good specimens of this original are in Herb. Calif. Acad., Herb. Field Museum, sheet n. 148012, the label on this bearing, what is rare, the place and time of collecting, and in Mr. Orcutt's hand.

58. E. ALIENA. Smaller than the last, somewhat similarly branched and many-flowered; herbage glabrous, glaucous: leaves small but rather freely cut into oblong but acute segments: subrotate corolla larger, 1¼ inches wide, apparently of a rather light yellow: stigmas 4, very slender and unequal: pods about 1¼ inches long, slender, very glaucous; torus under them short-subcylindric, the outer rim very narrow but coriaceous and manifest, the inner and hyaline margin quite obscure.

Nogales, in extreme southern Arizona, barely within the

United States, May, 1892, T. S. Brandegee, the type in Herb. Calif. Acad.

In the same collection, Calif. Acad. Herb., sheet 2627, from the same place and the same collector is another new *Eschscholtzia* of different habit and foliage, but the material is too imperfect for the requirements of a specific diagnosis.

59. E. Jonesii. Stout annual, sparingly branched from the base, nearly 2 feet high, sparsely leafy, glabrous, glaucous: basal leaves not seen, those of the branches of singularly triangular outline, rather broader than long, the lateral 4 of the about 5 divisions divaricate and rather remote each once or twice cleft into divergent linear acute segments: peduncles long, stoutish: calyx thin and diaphanous, ¾ inch long, ovoid-conical, scarcely apiculate: corollas large, 2 inches wide, open-campanulate, yellow: pods slender, 3 inches long; torus under them tubiform and rather long, with distinct but narrow coriaceous rim: seeds not seen.

At Hackberry, northeastern Arizona, 24, May, 1884, M. E. Jones; type in U. S. Herb.

60. E. Arizonica. Size of the last nearly, equally glabrous and glaucous, but freely and divergently branched from the base: leaves more copious, and of the same open dissection, but segments more numerous and scarcely acute: peduncles short: calyx less than ½ inch long, more ovate-conic: corolla nearly rotate but small, only 1 to 1½ inches long; torus under them short-tubiform, the narrow coriaceous rim hardly more obvious than the hyaline margin: seeds unknown.

Bradshaw Mountains, Arizona, J. W. Toumey, 22 June, 1892, in U. S. Herb. Plant in some respects recalling *E. microloba* of California; otherwise very different. A sheet in Herb. Calif. Acad., also from Arizona and by Mr. Toumey, but from the Santa Catalina Mountains, 8 Apr., 1894, may or may not be the same. The foliage is different, but the pods are small.

61. E. PAUPERCULA. Low annual, slender, sparingly branched from the base when not subacaulescent, the few branches rather rigidly upright; herbage very glaucous, glabrous: earlier leaves spatulate-linear, entire, those next succeeding 3-parted, the two lateral divisions entire, the terminal one trifid, all the lobes obtuse, those of the branches quinate and with few narrow divaricate divisions, the ultimate segments very acute: all the peduncles long, most of them scapiform: calyx not seen: corolla golden yellow, nearly rotate, 1½ inches broad: pods slender, 2 and even 3 inches long; torus very small, and with about equally prominent cartilaginous ring (rather than rim) and hyaline inner margin: seeds small, spherical, blackish and with rather few and large reticulations.

Eastern borders of the Mohave desert, California, and also on the other side of the Colorado River in Arizona, Norman C. Wilson, June, 1893.

62. E. MEXICANA, Greene, Bull. Calif. Acad. i. 69, in part, excl. syn. *E. Douglasii*, var. *parvula*. Stout subacaulescent annual 5 to 10 inches high, glabrous, glaucescent, at first with many rigidly erect scapiform peduncles of twice the height of the tuft of smallish and firm leaves: petioles broad and flat, about as long as the not large and coarsely dissected firm blades, ultimate segments of these not divergent, mostly oblong, acutish: calyx firm and opaque, the round-ovoid body surmounted by a stout prominent taper-point, the whole 7 or 8 lines long: corolla rather light yellow, 1½ inches broad, widely expanding: stigmas 4, not slender, very unequal; pods stout, 2½ inches long; torus with narrow and cartilaginous rim and almost as prominent hyaline inner margin: seeds spherical, mucronate-apiculate, coarsely and faintly reticulate.

This species was originally described from specimens of my own collecting on the upper Gila River plains, in 1880. I had seen acres of the same in 1877 farther westward toward Tucson, and, supposing these plants of Arizona and even extreme western New Mexico to be one with the plant of the Rio Grande

region in New Mexico and Texas, I cited Dr. Gray's *Eschscholtzia Douglasii* var. *parvula* as a synonym; a wrong inference; for I now find the plants of the Rio Grande region thoroughly distinct from my Gila Valley type.

The original specimens of *E. Mexicana* are in Herb. Calif. Acad. It will doubtless be found on both sides of the Mexican boundary, and the name will not be inappropriate.

63. E. PARVULA, Ckl. Bot. Gaz., xxvi, 279. *E. Douglasii*, var. *parvula*, Gray, Pl. Wright, ii. 10. Low annual, 6 to 10 inches high, with rather slender petioles and scapiform peduncles, and a soft and flaccid glabrous and glaucous foliage : leaves with 5 or sometimes 7 divisions moderately divergent, mostly ternate, a few biternate, the ultimate lobes or segments oblong, the middle one of the 3 larger and spatulate-oblong, obtusish: peduncles not twice the length of the leaves: calyx less than ½ inch long, subconic-ovoid, with distinct slender apiculation: corolla nearly rotate, 1½ inches wide, golden yellow: stamens many, the filaments long and linear, purple at summit: stigmas 4, stoutish not very unequal: pods 3 inches long, slender; torus with coriaceous rim narrow but manifest, the inner margin obscure.

Mountain districts along the Rio Grande from the Organ Mountains in New Mexico, through Texas and into Chihuahua. The most easterly species, so far as known; though not the only one extending into Mexico.

64. E. CYATHIFERA. Subacaulescent annual 6 or 8 inches high, the very short leafy branches and scapiform peduncles stout; herbage glabrous, glaucescent: leaves rather large, cut into very many only slightly divergent linear segments, the ultimates very unequal, mostly spatulate-oblong, obtuse or acutish: calyx an inch long, almost conical, with yet a distinct and not short scarcely tapering apiculation: torus large, funnel-form, with a very wide and conspicuous rim, neither reflexed nor spreading horizontally, tending away from the tube at no strong

angle of divergence, the whole torus thus somewhat cup-shaped: corollas, pods and seeds not seen.

Only a single specimen, and that in Herb. Calif. Acad., from Alcalde, Fresno Co., Calif., T. S. Brandegee, 1891; mounted on sheet n. 2632, along with two other species under the same label, all three new, and of two different sections of the genus.

65. E. INFLATA. Subacaulescent annual 5 or 6 inches high, glabrous, glaucous, the slender petioles quite as long as the peduncles at early flowering: leaves not large, cut into many oblong-linear acute nearly parallel segments; calyx very thin, ½ inch long or more, nearly conical but with very short slender point: corolla golden-yellow, nearly 2 inches broad: pods 2 inches long, not stout; torus under them large and more or less inflated, trumpet-shaped when only moderately so, others of extreme bladdery nature truncately obovate, the broad rim in such obscured.

Plains of Tulare Co., Calif., near Goshen, 2 April, 1891, Mr. Brandegee, type sheet of some six specimens in Herb. Calif. Acad. n. 2471.

66. E. QUADRANGULARIS. Rather compactly tufted annual 6 or 8 inches high, glabrous glaucescent: leaves erect on long petioles, much dissected, and irregularly into linear obtuse moderately divergent segments; the many scapiform peduncles surpassing the leaves, rather obtusely but obviously quadrangular and with alternating striæ: calyx thin, nearly conical, but with distinct and not short slender apiculation, the whole ¾ inch long: corolla golden yellow, widely expanding, 1¼ inches wide: stamens many, the filaments short, mainly dark-colored: pods slender, scarcely 2 inches long; torus under them funnelform, the coriaceous rim prominent, ascending: seeds not seen.

Only one specimen seen, but that a very good one, in Herb. Calif. Acad., from near San Rafael, on the eastern slope of the Lower Californian peninsula, by Mr. Orcutt, in 1885. The only species in this division of the genus with peduncles distinctly quadrangular.

67. E. HUMILIS. Compact subacaulescent dwarf 1½ to 3 inches high, the scapiform peduncles slender, not equalling the leaves until after flowering; herbage glabrous, glaucous: leaves on slender petioles, the blades very much dissected into short and rather broad segments, the ultimates often cuneate-obovate, more commonly spatulate-oblong, always acutish: corolla orange, nearly rotate, ¾ inch wide: pods slender, about 1 inch long; torus short-turbinate, the thinnish rim remarkably wide and conspicuous for the size of the plant.

Diminutive species, known to me only some half-dozen specimens in Herb. Calif. Acad, from Cape Colnett, Lower California, by Mr. Brandegee, 28 April, 1893.

68. E. EXILIS. Small nearly acaulescent annual, 3 to 5 inches high, glabrous, glaucous: leaves small and short-petioled but much dissected and irregularly so, the 3 ultimate segments mostly of two oblong lobes and a cuneiform tridentate middle one: peduncles elongated, stoutish: calyx small and conical: corolla an inch wide or less; stamens indefinite, the filaments slender, long, wholly yellow: stigmas 4, minute but unequal: pod 1½ inches long, torus under it short and turbinate, striate, with well developed rim, but inner margin not so.

Lagoon Head, Lower California, March, 1889, Dr. E. Palmer, forming a part of his n. 794 as in U. S. Herb. and Herb. Calif. Acad. Species akin to the *E. vernalis* of San Diego Co., Calif., distinguished from it chiefly by its subacaulescent and smaller growth and especially by its broad and short torus.

69. E. LEPTOMITRA. Annual, erect, 1 to 2 feet high, branched, only from above the base and sparingly, the leaves few and peduncles greatly elongated; herbage glabrous, merely glaucescent: leaves of the simple basal trunk linear-filiform, at first simple, 2 or 3 inches long, the rest parted at apex into 2 or 3 short filiform lobes or segments, even the rameal ones long-petioled, but blade finely cut into few or many linear acute segments little divergent: calyx more than 1 inch long,

the oval body hardly as long as the slender and gradually alternate apiculation: corolla large, nearly or quite 2 inches wide and only open-campanulate: torus short-funnelform, with very broad but thin rim: pod rather slender, 2 inches long or more: seeds not seen.

Remarkable species, known to me in but a single specimen on sheet 2653, Herb. Calif. Acad., purporting to have come from Santa Barbara, Calif., through Mrs. R. F. Bingham, in 1886. Probably of insular origin.

70. E. ROBUSTA. Annual, upright, branched from above the base, very robust, the main stem and primary branches more than ¼ inch in diameter even when dry; herbage glabrous, glaucous: leaves ample, much subdivided into narrowly linear segments, the ultimates sometimes short, always acute: mature calyx not seen: corolla not large for the plant: pods stout, 3½ inches long: torus under them turbinate, with strongly developed rim ½ inch in diameter more or less.

Santa Rosa Island, Calif., April, 1888, T. S. Brandegee; probably the plant referred to in Proc. Calif. Acad. 2 Ser. i. 206 as growing "On the loose soil of steep slopes." Types, two sheets in Herb. Calif. Acad., labelled "*E. Californica*," but with the synonym "*E. glauca*, Benth." *E glauca* is, of course, my own species, and of Santa Cruz Island. But this, by its annual root, totally different habit, and large broad-rimmed torus, is a most distinct species.

71. E. CRASSULA. Low very robust annual, with few stout divergent leafy and floriferous branches from toward the base, the plant as a whole somewhat dendroid, glabrous, glaucous: leaves large, on very slender petioles, elegantly cut into long narrowly linear widely divergent segments, the ultimate 3 subequal, linear, straight; corolla small, cruciform, the obovate petals not meeting: stamens about 8, the very slender filiform filaments longer than the anthers: pods 2½ inches long, very stout, obtuse, thin-walled, finely many-striate: seeds small, slightly ovoid, tuberculate-roughened, not reticulate.

Maritime species, apparently endemic on the group of small low rocky islets known as the San Benito Islands, off the coast of Mexico; collected in young flowering state, 11 Jan., 1889, by Lieut. Chas. F. Pond; also later in the same year by Dr. E. Palmer, whose specimens, in U. S. Herb., are in fruit. The plant was referred to the more commonly diffused insular species, *E. ramosa;* but while in habit the two are much alike, the leaves, pods and seeds of *E. crassula* are all very distinctive. It is also further distinguished by its few and very stout fistular branches.

72. E. RAMOSA, Greene, Bull. Torr. Club. xiii. 217. Stout upright annual sometimes a foot high, dendroid in habit by its system of divergent branches originating quite above the base and leaving a simple trunk-like stem below; herbage glabrous, glaucous: leaves ample, copious on all the branches, of a most fine and delicate lace-like dissection, the ultimate segments very short, in threes of which the two laterals usually converge at apex towards the middle one: pods 3½ inches long, slender, of hard texture, marked with few and prominent striæ: seeds spherical, distinctly and even strongly reticulate, without trace of tuberculation.

Also a maritime species, first collected by myself on the sea beach under overhanging cliffs at the north end of Guadalupe Island; this in 1885; and in the same year it was detected by Mr. Lyon on San Clemente. A year later I discovered it on a rocky islet off the shore of Santa Cruz Island,; this its northern limit, doubtless. It occurs on many islands and islets off the Californian coast, but has not been detected on any mainland shore. Mr. Anthony's specimens from Todos Santos Island are branched from the base, hardly dendroid, and perhaps should stand for another species. I also doubt the correctness of referring any of the so-called *E. ramosa* of the islands San Clemente and Santa Catalina to this species. They seem to be upland plants, rather than maritime, and are otherwise obviously different in some degree.

73. E. TRICHOPHYLLA. Annual, erect, a foot high or more, with few and stout ascending leafy and sparsely fioriferous branches from below the middle; herbage glabrous, glaucescent: leaves ample, their petioles long and very slender, the blades cut into many long filiform segments, the ultimates very unequal, mostly somewhat dilated at the apex: flowers all near the summit of the plant, on short petioles barely exceeding the almost capillary foliage: corolla very small for the plant, ¾ inch broad, nearly rotate: stamens 12, elongated, the anthers and flattened subulate filaments of about equal length: pod and seed not seen.

Summit of Santa Cruz Island, April, 1888, T. S. Brandegee; type in Herb. Calif. Acad., sheet 2529, mounted with a small plant of the maritime *E. ramosa*, and over the same label. Most distinct from all other species by its capillary foliage and peculiar stamens.

74. E. CROSSOPHYLLA. Glabrous glaucous annual about a foot high, the habit in nowise dendroid, the branching beginning at the base and being loosely fastigiate, ultimately even with some appearance of dichotomy: foliage small, very delicately triternate, all the segmentation narrow, all linear except the ultimates, these mostly dilated at apex and abruptly acutish: corolla ¾ inch wide: stamens 12, anthers elongated, longer than the merely filiform filaments: pods 2 to 2½ inches long, slender but rigid and with few striæ: seeds spherical, the reticulation not favose, mostly very irregular but not indistinct.

Elevated dry rocky slopes of Santa Catalina Island, Calif., May, 1889, T. S. Brandegee, in very mature state, copiously fruiting; also a young flowering specimen from "Hay Press Trail" on the same island, by Mrs. Trask, March, 1895; specimens in Herb. Calif. Acad., the last mounted on a sheet with two other species.

75. E. ELEGANS, Greene, Bull. Calif. Acad. i. 182 in part, excl. var. *ramosa*. Annual, erect, a foot or two high, very leafy

toward the base, below the middle parted into several long ascending and somewhat naked flowering branches; herbage glabrous, glaucescent rather than decidedly glaucous: leaves compact, cut into very many almost parallel oblong-linear and linear acutish segments: calyx scarcely ½ inch long, oval, abruptly apiculate: corolla rotate, hardly an inch wide: stamens 16 or 20, long, the filaments and anthers of about equal length: pods thin-walled, slender, 3½ inches long; torus under them almost tubular, fully ¼ inch long; seeds oval, mucronate at each end, indistinctly tuberculate, not reticulate.

Summit of Guadalupe Island, chiefly to the southward; type specimen in Herb. Calif. Acad. collected by myself in 1885. One in U. S. Herb. by Dr. Palmer in 1889 is more glaucous, less elegant in cut of smaller foliage, and has a shorter torus, yet specifically the same doubtless.

76. E. Parishii, Greene, Bull. Calif. Acad. i. 183. Annual, slender, 6 to 12 inches high, glabrous, glaucous, proper leaves, all in a basal tuft on upright petioles, the rather few flowering branches with only scattered and reduced foliage: leaf as a whole broad and short, of angular outline, the segments linear, widely divergent, the ultimate 3 with middle lobe longer but not dilated, all acute: peduncles like the stem and branches terete, not even striate: calyx small, ⅓ inch long, ovate-conical, thin, attenuate to a short apiculation: corolla deep-yellow, nearly an inch broad, the later ones somewhat cuneiform, being notably expanded and the cuneate-obovate petals overlapping only near the base: stamens many and filaments slender though short, not half as long as the long linear anthers: torus with slight but evident outer border, the inner more manifest: pods very slender and thin-walled: seeds slightly elongated, distinctly reticulate.

Native of the Colorado Desert, southern California, collected by Parish, W. G. Wright, and others. Mr. Parish is responsible for an error in my first definition of the species as to habitat. The printed label under which he sent it to Calif. Acad. reads

as I said, "Eastern slope of Mt. San Jacinto." But the corresponding label for the same collecting of the plant now before me in Mr. Parish's own herbarium has the locality corrected to "Whitewater" which is on the border of the Colorado Desert The species is akin to *E. hypecoides*, differing from it greatly in habit, showing comparatively few flowers on long upright peduncliform branches, and being wholly glabrous: the buds also being always longer and attenuate. Its corollas are not much larger than those of genuine *E. minutiflora* but the foliage and manner of growth are very different.

77. E. PTARMICOIDES. Annual, sparingly branched from the the base, a foot high, the branches smooth, not striate, herbage glabrous, glaucescent: leaves little dissected, mostly of 5 divisions: of which all but the lowest pair, and sometimes even these, are merely cleft into 3 cuneiform 3-dentate acute lobes: upper rameal leaves much simpler, apt to consist of 3 spatulate-linear and long entire segments: calyx less than ½ inch long, elliptic-ovoid with abrupt and stout but short apiculation: corolla golden-yellow, little more than 1 inch wide: stigmas 4. equal or nearly so, very slender above a peculiarly subulate-dilated base: slender pod 1½ inches long: torus very small. short-turbinate.

Los Angeles Bay, eastern shore of the Lower Californian peninsula. Dr. E. Palmer, 1887: type in U. S. Herb., sheet 3354. In segmentation of foliage promptly recalling that of certain Anthemideæ.

78. E. MINUSCULA. Small and small-leaved rather succulent annual 2 to 6 inches high, slenderly branched from the base, the branches at early flowering little or not at all surpassing the basal leaves, yet not scapiform but leafy, each with several small flowers; herbage glabrous, glaucous: the very lowest leaves linear, entire, those next them nearly 3-parted and the divisions 3-lobed at summit, the others biternate, their ultimate segments broad and 3-toothed, the floral ones reduced to 3tri-

dentate segments: peduncles filiform, terete, tortuous in flower: calyx very thin, ovoid or obovoid, scarcely apiculate, hardly 2 lines long: torus a short cup, thinnish below the margin, corolla ½ inch broad or less: stamens few and definite: pods slender, 1½ inches long, immature, torulose.

Most peculiar species, known by two sheets in U. S. Herb., one by M. E. Jones from Hawthorn, Nevada, near the Californian boundary, the other by C. A. Purpus from "Erskine Creek, southeastern California," but Mr. Purpus' specimens are mixed with one of perhaps *E. glyptosperma*, and perhaps others of true *E. minutiflora*.

79. E. RUTÆFOLIA. Small annual, branched, from the base, leafy throughout, 3 to 6 inches high, glabrous, very glaucous: basal leaves not densely tufted, all on petioles, much longer than the small blades, these almost simply ternate, some of the largest imperfectly biternate, the divisions merely lobed, the lobes broadly cuneiform and 2 or 3-toothed at the obtuse summit, those of the upper part of the branches flabilliform, cut into 3 approximated segments each cuneate and, at the broad truncate summit lightly 3-toothed: flowers small, short-peduncled in the axils of the long-petioled stem-leaves which greatly surpass them; buds scarcely ¾ inch long including the comparatively large broad-obconic torus, obovate-oblong, merely acute, the calyx very thin and translucent: petals light-yellow, only ¼ inch long, apparently fugacious: pod and seeds not seen.

A single sheet of specimens in Herb. Calif. Acad., collected at Havilah, Kern Co., Calif., 15 April, 1891, by Brandegee. The cut of the leaves is peculiar, and not so much that of rue, as of the little fern called *Ruta muraria*.

80. E. BITERNATA. Very slender annual, with few and erect sparsely leafy branches from the base, glabrous, glaucous: basal leaves small on short and slender petioles, these quinately ternate, the lobes rather short, all the others merely biternate,

composed of 3 slenderly petiolulate divisions, each cleft into 3 oblong lobes: calyx ¼ inch long, of elliptic outline with very short point; corolla very small, ½ inch broad, orange-color: stigmas 2 and small, with mere traces of the other 2: pods thin-walled, small, only 1½ inches long: seeds few, large for the plant, quite spherical, blackish and lightly reticulate.

Upper Mad River, Trinity Co., Calif. 28 June, 1893, J. W. Blankinship: type in Herb. Calif. Acad. This very characteristic species, and these specimens are, I think the only eschscholtzias seen in any herbarium from that large mountainous unexplored county of Trinity. Collectors seem afraid to go into those wildernesses.

81. E. LUDENS. Low annual, glabrous, glaucous, 3 to 6 inches high, all the slender branches rigidly erect or ascending from amid a distinct tuft of upright basal leaves and all subscapiform, the one earliest flower on a naked peduncle, all the others on pedunculiform branches naked to near the summit, these bearing 2 subopposite leaves and a few subumbellate flowers: leaves all short-petioled, rather compactly multifid, the ultimate segments short, oblong and obovate-oblong obtusish: calyx 2 lines long, thin, obovate, pointless: corolla rotate, 4 or 5 lines wide: stamens 8 only, the subulate filaments and oblong anthers about equal: pod stoutish for the plant, 1 to 1½ inches long.

St. George, southern Utah, M. E. Jones, 26 April, 1894, the type specimens in U. S. Herb. Plant of peculiar habit; in the subumbellate branching of the stems near the summit, it recalls that Californian rarity, *E. hypecoides*, to which, however, it is not very intimately allied. Other specimens from southern Utah seem to belong here.

82. ASPRELLA. Dwarf annual, in full maturity 5 inches high, subacaulescent, glaucous, scabro-hispidulous throughout even to the torus and pods: leaves nearly all basal, cut into many short acute segments; only the earliest flower on a naked

and simple scapiform peduncle, the later on once or twice forked branches with a reduced leaf at base of each fork or peduncle, all the latter quadrangular: flowers and even full-grown buds not seen, but calyx in a few small buds narrow-conic, hoary with a pubescence softer than that of other parts: torus long and almost tubiform, rather sharply angled as well as hispidulous, not contracted above, only the inner and hyaline margin obvious, a mere delicate ring marking the place of the outer: pods 1½ inches long, subfalcate: seed round-ovoid, mucronate-apiculate at one end, marked with elevated more or less interrupted sinuous rugosities rather than reticulate.

San Migueleto Ranch, Monterey Co., Calif., May, 1897, Miss Eastwood. A solitary specimen in Herb. Calif. Acad. of a singularly marked species of which the flowers are unknown.

83. E. EXIMIA. Rather large annual, commonly a foot high, branched from the very base, and widely, the branches apparently only decumbent, and from amid a large tuft of basal leaves, also leafy throughout, copiously floriferous from the middle, the flowers very large for this group, on almost filiform peduncles, the buds nodding; lower parts of the plant, but also again the young calyxes, hirtellous-scabrous, only glaucescent: leaves finely cut into many rather short oblong obtusish segments quite divergent: calyx thin, ¾ inch long, almost conical, the apiculation manifest but short: corolla more than 1½ inches wide, open-campanulate, golden-yellow: stamens many, slender: pods not seen: torus short, funnelform.

In Herb. Calif. Acad. from Zapato, 27 March, and Alcalde, 30 March, 1893, T. S. Brandegee, both stations in, I think, western Fresno Co., California. An exceedingly beautiful species, of which, I seem to think I saw at Kew, in 1894, some fragments that had been collected by Douglas. It is otherwise unknown, and presumably very local.

84. E. ALCICORNIS. Annual, 4 to 10 inches high, freely branched from the base, leafy throughout: lower parts of stem

and petioles hirtellous-scabrous: leaves glabrous, glaucous, the divisions rather widely divergent, each division cut into 3 broad segments, each broadly cuneate and 3-cleft, the ultimate lobes broad, truncate, equally 3-toothed at summit: calyx thinnish, narrowly and acutely ovoid, ½ inch long or less, sparsely hirtellous: corolla ¾ inch broad: torus short, turbinate, glabrous, the erect hyaline inner margin the more conspicuous: growing ovaries and small immature pods glabrous.

Alcalde, Calif. 1891, T. S. Brandegee; two specimens forming part of Herb. Calif. Acad. sheet n. 2,632. Also at Alcalde 1893, Miss Eastwood, in Herb. Field Mus., sheet n. 82048. Intimately related to *E. eximia*; smaller in all its parts, and foliage more compact, of irregular cut, suggestive of the branching of a stags horn; but several other desert species have a like dissection.

85. E. HYPECOIDES, Benth. Trans. Hort. Soc. Ser. II. i. 408, not of any more recent anthers. Annual, upright, 4 to 14 inches high, with many branches from amid the basal leaves, all naked to the middle, there parted into several widely diverging and freely flowering branches, the branching dichotomous, a pair of nearly opposite leaves at base of each fork; herbage merely glaucescent and the whole plant, usually even to the calyx, more or less subpapillose hirtellous: leaves small for the plant, mostly broader than long, their segments short, oblong and linear-oblong, acute: calyx thin, round ovate, abruptly acuminate, about ¼ inch long: corolla rotate, ¾ inch broad, the petals greatly over-lapping: stamens many, the filiform filaments and linear anthers of about equal length: stigmas 4, not very unequal: torus long and almost tubular, neither margin very obvious: pods 1½ to 2 inches long, slender thinnish: seeds spherical or slightly elongated, marked with a strong and elevated reticulation.

Among the several species of the genus earlier published this is the rarest, and has been no better than unknown for sixty years past, except as to the specimens collected by Douglas, and

preserved in one or more European herbaria. While at Kew in 1894 I sought out what purported to be Bentham's type specimens, and was not a little surprised to note that they represented a plant totally unknown to me; and I found that the species would have to be considered one of that number that have apparently become extinct since the days of the early collectors in the then uncultivated wilds of California.

But I am glad to concede to Miss Eastwood, of the California Academy, the honor of having re-discovered a plant so long lost. Her specimens are all from an isolated valley lying just east of Monterey County, between two ranges of mountains, but within the county of Fresno. The locality is not remote from Monterey, and Douglas, the only other collector of the species, may have visited just this region; or the plant in his day may have had a wider range.

86. E. COVILLEI. Smallish annual rather freely branched at the very base and decumbent, not very slender, seldom 10 inches high, glabrous, glaucous; basal leaves copious, but the broad petioles of great inequality, the longer straggling, the tufted aspect not pronounced: branches scarcely striate, loosely leafy and floriferous throughout: leaves smallish, rather firm and fleshy as well as compact, cut into uncommonly broad and short segments, these mostly short-oblong, some obovate, all acute: calyx thin, 3 or 4 lines long, ovate-conical, merely acute: corolla ½ or ¾ inch wide, open-campanulate: stamens about 12, the slender-subulate filaments longer than the oblong anthers: pod 1½ to 1¾ inches long, firm, striate.

Low deserts of Inyo Co., southeastern California, copiously gathered by Coville & Funston on the Death Valley expedition, and catalogued by Mr. Coville, under my advice, as *E. minutiflora*. The Death Valley Exp. n. 334 represents the plant as found at the first flowering, 19 and 20 Feb., 1891. These specimens as in U. S. Herb. show the loose bunch of straggling rather than tufted foliage, with the very first flower present on a slender scapiform peduncle much shorter than the leaves. No.

519, taken in early April, and from the Panamint mountain cañons, is large, freely branched, exhibiting many buds on slender nodding peduncles, and as many flowers, as well as the full grown pod on each early scape-like stalk. In Herb. Calif. Acad. there is a fine specimen from Lone Pine, Inyo Co., by Brandegee, 16 April, 1891. This is more mature than any of those collected by Mr. Coville.

I at first tried to place this as a variety of *E. minutiflora*, and even so named it at an early stage in the course of this trying and perplexing study. It is a plant of the same size, with foliage and flowers about as large. But the difference in cut of leaves, as well as texture, and the whole habit and aspect of the two, declare them not even very closely related, and I suppose that, had I had experience of the topographic and climatic differences between the mountains of northern Nevada and the deserts of Inyo Co., California, I should not have thought them possibly one species.

87. E. MODESTA, Greene, Pitt. i. 168. Annual, widely much branched from the base, not very slender, commonly forming a leafy and floriferous mass less than a foot high, more than a foot wide, but sometimes taller and lax; herbage glabrous, glaucescent: leaves copious, clothing not only the base of the plant but all the branches and branchlets, the divisions divergent, but ultimate segments hardly so, linear, obtuse; peduncles terete short, of less than half the length of the pods, these 2 inches long: calyx 2 lines long, thin, obovate, obtuse, without apiculation: corolla rotate, ½ inch broad, cruciform, the obovate petals not meeting: stamens 8 in early flowers, 4 in the later; anthers small, of half the length of the filiform filaments: torus short, cup-like, no marginal rim obvious: pods more firm and striate than in allied species: seeds spherical, reticulate.

Known at first only as collected 7 June, 1887, by Mr. Parish, at Alpine, Los Angeles Co., Calif., and as cultivated by me at Berkeley a year later. My earlier diagnosis was of living plants as they appeared in my garden, certain specimens of

which were afterward pressed, and I think some duplicates distributed to several herbaria. But the appearance of these specimens is very different from that of the originals gathered and distributed by Mr. Parish. Any plant indigenous to a desert mountain region of the distant interior would inevitably develop, in the cool moist seaboard climate of the environs of San Francisco Bay, into something less robust, if not, as in this case, into a taller and more lax herb. I have here amended the description according to the requirements of the original wild specimens of the arid southern interior.

The species seems next of kin to real *E. minutiflora*, but has a much more robust diffuse mode of growth, a very different calyx, and seeds more definitely reticulate, besides other substantial differences.

88. E. MICRANTHA. *E. minutiflora*, Greene, Bull. Calif. Acad. i. 70, also in part of S. Watson. Much branched from the very base, the primary branches slightly decumbent, otherwise rigidly erect, diffuse above with many rigid and rather wiry branchlets and short peduncles, all these terete, not even faintly striate, clothed throughout with small leaves and copiously floriferous, the plant 1 to 1½ feet high, glabrous, glaucous: even the basal leaves small, firm, upright on short petioles, the ultimate segments very short, or on some leaves oblong or obovate oblong, mostly acutish: numerous peduncles, very short, few exceeding an inch in length, many not half an inch: calyx minute, thin, round-obovate, mucronulate: petals hardly a line long, rotately expanding, not overlapping: stamens at first 8, later 4 only: anthers short, on filiform filaments: pods 1½ or 2 inches long, very slender, thin-walled: seeds spherical, reticulate.

This species is primarily, if not almost exclusively of the Mohave Desert, southeastern California. It entered into the composition of Mr. Watson's *E. minutiflora*, and is in fact the only plant to which that name is appropriate. I have, however, left that name connected with plants collected by himself

in a region remote and totally different from the Mohave Desert, the specimens of which are the only ones he definitely cites in his original account of what he at last proposed as a species.

Twenty years ago I too readily took this only really minute-flowered *Eschscholtzia* of the Mohave to be typical of *E. minutiflora.* The specimens before me now are, the originals of Mrs. Curran's collecting, mainly preserved in Herb. Calif. Acad., one of them having found its way to Herb. Field. Mus., where it occupies sheet 148,002. All these originals were taken in June, which is very late for that region, and are copiously fruiting, the corollas being at their most reduced stage as to size. Plants somewhat younger were gathered by Mr. Lemmon, in the same region, though on the eastern side of the Colorado, in southern Nevada, as early as 1875; yet in these the corollas are little larger, and the characters of calyx, stamens, and all else, remain the same; and this is true of a sheet in U. S. Herb. by M. E. Jones, taken at Yucca, Ariz., 13 May, 1884.

Two sheets in U. S. Herb. (nn. 3336 and 3338 by Orcutt,) from the Colorado Desert, I place with reluctance under *E. micrantha.* They differ somewhat, habitally and as to foliage; less different are two Lower Californian specimens in Herb. Calif. Acad. by Brandegee, one from Constantia, the other from San Enrique. And so *E. micrantha* will be received as a species of an extended geographic range through low and arid southwestern deserts chiefly west of the Rio Colorado and the Gulf of California.

89. E. TORTUOSA. Annual, a foot high or more, rather slenderly branched from the base, the branches at base decumbent, rather naked as to foliage, variously curving and tortuous, the whole plant glabrous, glaucescent, the stems faintly striate: leaves broadly triternate, each main division subtruncate by the nearly equal length of the parallel oblong acute segments; the floral often reduced to 3 three-lobed or toothed divisions: peduncles many, short, very slender: calyx diaphanous, 4 lines long, ovate-conic, pointless, or nearly so; corolla orange, ½ inch wide:

stamens 8, anthers as long as the filaments: pods 1½ inches long, very slender, few-seeded, apt to be torulose above the middle, the walls very thin.

This is based on a single sheet in U. S. Herb., collected by Mr. Parish in 1894, at Byrne's Spring on the eastern slope or at the base of the San Bernardino Mountains, the date June 16. Its strong points of divergence from *E. modesta* on the one hand and *E. micrantha* on the other compel its recognition as a species, perhaps local.

90. E. URCEOLATA, Eastw. Bull. Torr. Club, xxx, 488. Stout but low annual, often subacaulescent, 6 or 8 inches high, the larger plants freely branched from the base and the branches leafy; herbage glaucescent, at least the lower parts of stems, the petioles and peduncles—sometimes even the petiolules of the upper leaves and the calyx—papillose-hispidulous or hirsutulous: leaves ample, the divisions not closely approximate, the ultimate segments rather polymorphous, mostly long, the middle often notably broad and its laterals very narrow, all apt to be abruptly acute: calyx nearly an inch long, thin, conical, almost pointless: corolla 2 inches wide, golden-yellow: stamens many, the long anthers on stout narrow-subulate filaments, these purple at summit: stigmas 4, very unequal: pod very stout, 2½ to 3 inches long, torus very large, urceolate by contraction at the orifice.

Carrizo Plains, interior of California, well southward, Miss Eastwood, 2 May, 1896.

91. E. CRUCIATA. Rather slender annual a foot high, at first with not a few long and slender subscapiform peduncles, later with loosely leafy several flowered branches; herbage glaucescent, nearly glabrous, an obscure line of short hispid hairs marking here and there a branch, or the margins of some petioles, these elongated; leaves cut into many long narrow-linear slightly divergent acutish segments: calyx nearly ½ inch long, subconic, short-pointed: corolla widely expanding and cruciform,

cuneate-obovate petals not meeting, ¾ inch long or more: stamens 12–16, with short filaments filiform, above an abruptly dilated base: stigmas 4, very long, not very unequal: pod rather stout, about 2 inches long: torus very long, tubular-funnelform.

Type from Huron, Fresno Co., Calif., 8 May, 1893, Miss Eastwood. Also apparently the same from Buena Vista Hills, not far distant, though in Kern Co., 9 April the same year; this, however, less caulescent, and with broader petals.

92. E. MINUTIFLORA, Wats. Proc. Am. Acad. xi, 122, in part and as to plant of northwestern Nevada only. Rather slender glabrous glaucescent annual 7 or 8 inches high, the not very many branches apparently weak and straggling rather than properly decumbent, somewhat copiously leafy throughout, the flowers on peduncles not exceeding the leaves; dissection of foliage rather open, the divisions not crowded, the ultimate segments linear, obtusish, very moderately divergent: calyx about 2 lines long, ovate, acute, or acuminate, not truly apiculate: corolla apparently orange, 4 lines broad or less: stamens 8 or 12, oblong anthers shorter than the slenderly subulate filaments: pod slender, fully 1½ inches long.

For what was with Mr. Watson, and even with myself twenty years ago, a rather vast aggregate, I select Mr. Watson's own plant of northern Nevada as the type to bear the name *E. minutiflora*. By its soft foliage cut into long and narrow little divergent segments, by the absence of any tuft of basal leaves and the equable leafiness of the whole plant, it stands in very marked contrast with every one of those more southerly and desert species, that have even smaller flowers, one of which Mr. Watson knew and included under the *E. California* var. *hypecoides* of the King's Expedition Report, and in the *E. minutiflora* subsequently published.

The above diagnosis is from material of Mr. Watson's own collecting at Truckee Pass, May, 1868, and the label bears this number 51. On the sheet in U. S. Herb. the two cotyledons still persist, are entire, and so extremely narrow that one may almost

call them filiform. The properly basal leaves are two or three only. The earliest flower was borne on a truly scapiform and slender peduncle not much longer than the pod it bears.

93. E. PUSILLA. Slender annual with tufted stems or branches 5 to 8 inches high, rather freely floriferous on many more or less fastigiate leafy branchlets; herbage glabrous, glaucous leaves much dissected though small, the segments oblong-linear, acutish, moderately divergent: calyx very thin, extremely small, ¼ inch long or little more, elliptic-oblong, barely mucronulate rather than apiculate; corolla ½ inch broad: slender thin pods 1 inch long or little more, mostly beaked by vacant terminal part; torus very small, subturbinate: seeds oval, reticulate.

In the Sierra Nevada, Calif., at Kernville, Kern Co., 13 May, 1891, T. S. Brandegee, type in Herb. Calif. Acad. Interesting species, with fastigiate or subumbellate clustering of upper branchlets and peduncles; the buds of peculiar shape, and delicate pods the smallest in the genus.

94. E. CARUIFOLIA. Annual, slender, branched from the base, the branches scarcely decumbent, a foot long or more, loosely and rather amply leafy throughout; plant wholly glabrous, glaucescent: leaves cut into few very long and narrowly linear acute rather widely divergent segments: peduncles few and very long, though but the one earliest one truly naked and scapiform: calyx very thin and diaphanous, fully 1 inch long inclusive of the conical body and very long and slender caudiform acumination: corolla large, 1½ inches long: stigmas 2, very slender and unequal: slender straight pod extremely long, 3½ inches, torus very small and short, narrowly turbinate, the ring well developed but inner margin mcre conspicuous: immature seeds elliptic-oblong.

Leesville, Colusa Co., Calif., April, 1889, Brandegee: type in Herb. Calif. Acad. Most remarkable species, of which I should like to see the cotyledons; for it is one of a very few concerning which, in default of these, one may doubt whether it be of this section of *Eschscholtzia.*

95. E. ROSTELLATA. Habit of the last, or perhaps more widely branched and diffuse, far more slender, glaucescent, lower petioles and parts of stems more or less definitely scaberulous; leaves and flowers very much smaller, the former cleft into not many nor widely divergent long and very narrow linear segments: calyx about 4 lines long, including the slender and not short taper point, the body ovate-elliptic: corollas many, little more than ½ inch wide, nearly rotate, orange-color: stamens 12 to 16, filaments long and filiform, anthers much longer, narrowly linear: stigmas 2, with 2 short rudiments: pods 2 inches long, extremely slender, vacant for ½ inch at summit, this part forming a conspicuous slender beak: seeds always few in the pod, ovoid, with a long apiculation at one end, the surface lightly reticulate.

Known only in a single sheet of two fine, even perfect specimens in Herb. Calif. Acad., from Coloma, El Dorado Co., Calif., 30 May, 1901, by G. P. Rixford. Very distinct from all other species, even from *E. caruifolia*, to which it is nearly akin.

96. E. VACCARUM. Size of the last, equally glabrous and glaucous, more upright, much more sparingly branching, all the stems, branches and even peduncles stouter and evenly striate, not angular: segmentation of leaves much narrower and finer: calyx ovoid with abrupt and prominent apiculation: corolla larger; pods slender, straight, 2½ inches long; seeds not seen.

Cow Creek Mountains, in the Malheur Lake desert region of southeastern Oregon, 27 May, 1887, L. F. Henderson: type specimens in Herb. Parish.

97. E. OREGANA. Annual a foot high, freely and somewhat decumbently branched from the base, the branches subdivided, leafy and floriferous throughout, with no pronounced tuft of basal leaves even at first, all the stems and branches, about 5-angled and not striate; herbage glabrous, glaucous; leaves all smallish, the segmentation narrowly linear, acute, moderately divergent, the ultimate segments of the very earliest leaves a

little dilated: calyx thin, 4 lines long, ovoid-conic, with very short and small point: corolla hardly an inch wide, pod slender, about 2 inches long; seeds round-ovoid transversely papery-rugulose rather them reticulate, or the appendage more or less, broken into a tuberculate roughness.

Dry hillsides at Glendale, southwestern Oregon, Thomas Howell, 30 April, 1877: type in my herbarium. Since Douglas was in this part of Oregon, the present plant might possibly turn out to be Bentham's *E. tenuifolia;* though I think it improbable.

98. E. PETROPHILA. Perennial, the many slender stems upright or ascending, forming a rather compact reedy mass 8 or 10 inches high, the whole plant pale and glaucous, apparently glabrous, but under a lens seen to be sparsely scaberulous at least on all the angles, especially on the margins of the petioles; main stems all leafy, only sparingly branched, angular rather than striate: leaves small, longer than broad, segments not widely divergent, the ultimate ones oblong-linear, acute: peduncles quadrangular; calyx less than ¼ inch long, obovate, abruptly apiculate: corolla nearly rotate, ½ inch broad, apparently light-yellow: pods 1½ inches long, slender and remarkably slender-pointed; torus short, neither margin obvious.

This, a most notable accession to this division of the genus, on account of its perennial root, is before me in but a single specimen, collected by Purpus, and said to inhabit stony slopes of Pah-Ute Peak among the high mountains of Kern Co., Calif. The type is sheet 328,518 U. S. Herb.

99. E. DUMETORUM. Annual, 8 or 10 inches high, the crowded stems ascending or decumbent, yellowish and straw-like, lightly striate, the rather small foliage glaucous, also glabrous except as to the petioles of the basal leaves, these sparsely but saliently papillose-dentate: leaves rather small and delicate, each of the five divisions 3-ternate. the ultimate segments subulate-linear, acute: calyx very thin, almost filmy, about ½ inch long includ-

ing the very prominent though slender point, the body oblong-ovoid: corolla orange, ½ inch broad: proper stigmas 2, with trace only of the other two: pods very slender and straight, 2½ inches long; torus very short: seeds not seen.

Summit of Yolo Mountains, Yolo Co., Calif., 8 May, 1903, C. F. Baker, distr. n. 2995. Described by Mr. Baker as forming large tufts under the shelter of the light mountain-side shrubbery of *Adenostoma*. As to the subulate-linear segments, this might be *E. tenuifolia*, Benth. But it is local on mountain summits beyond the limits of Douglas' Californian travels.

100. E. Bakeri. Habit of *E. dumetorum*, pale and with small foliage, glaucescent, glabrous: small and delicate leaves cut into narrowly spatulate-linear obtuse scarcely divergent segments: peduncles many and stoutish: calyx little more than ¼ inch long, but nearly as thick as long, round-ovoid, very obtuse, abruptly short-pointed: corolla-rotate, about an inch wide, light-yellow: stamens 20 or more, the anthers very long, the filaments very short: pods small, hardly 2 inches long: torus under them extremely short, cup-shaped, even slightly urceolate by constriction just beneath the border.

Dividing ridge of mountains between Lakeport and Hopland, Lake Co., Calif., C. F. Baker, 12 May, 1903; distributed under n. 3094, and by my advice as *E. caespitosa*, from which it differs widely, the characters of calyx, stamens and torus all strong.

101. E. caespitosa. Benth., Trans. Hort. Soc. 2. Ser. i. 408, not of Greene, Fl. Fr. 287, *E. Austinæ*, Greene, Bull. Calif. Acad. i. 69. *E. tenuifolia*, Benth,?? *E. hypecoides*, Greene, Fl. Fr. 286 (not Benth.) in part (excluding Howell's Oregon plant, which is *E. Oregana*). Annual, a foot high and even more, when well grown and mature, freely branched from the base and more or less leafy to the middle, scaberulous or even hirsute as to basal parts, seldom if ever quite glabrous, leaf-segments linear-cuneiform, moderately divergent: calyx very thin, oblong-conical, slenderly taper-pointed: corolla rather large, yellow:

outer filaments subulate and short, inner much longer, filiform: pod $2\frac{1}{2}$ inches long; torus under it short-tubular: seeds ovoid, acute at one end, irregularly but not faintly reticulate.

Plant common on the hills of the coast mountains of California from near the northern arm of San Francisco Bay at least to Lake and Colusa counties, thence southward along the foothills of the Sierra Nevada from Butte Co. to at least Amador and Stanislaus, unless among the numerous specimens from various parts of this vast territory I am including more than one species. Plants from the vicinity of Ione and the Stanislaus have a much narrower leaf-segmentation, and would answer to Bentham's obscure and troublesome *E. tenuifolia*, but the calyx in these does not at all agree; and Douglas did not visit these remote and, in his time, wildest and unsettled parts of California. Common as the species is, in its early stage, that in which Bentham had it, when it appears subacaulescent, I find next to no specimens in the herbaria; and in those which exist now so copiously, Bentham himself would never have recognized his own species, so completely different are they, habitually, from what the plant must be in early spring, when all the peduncles are scapiform.

At Kew, in 1894, with the types before me, I seem to have made out real distinctions between *E. cæspitosa* and *tenuifolia*, but the notes, if I made any, are long since lost.

102. E. TENUISSIMA. Slender annual about a foot high, rather freely branched from the base as well as copiously leafy there; slender petioles and lower parts of branches often hispidulous, sometimes quite glabrous, the plant always glaucous: leaves cut into many long narrow-linear segments only little divergent: very slender peduncles 5-angled, the several early and scapiform ones much longer than the leaves, the latter less scapiform but long, terminating sparsely leafy branches: calyx $\frac{3}{4}$ inch long, diaphanous, the elliptic body surmounted by a usually very long and slender acumination: corolla large for the plant, golden-yellow or even almost orange, not widely

expanding: stamens often 20, of short purple-tipped filaments and much longer anthers: stigmas 4, slender, unequal: pods slender, 3½ inches long.

Middle elevations of the western slope of the Sierra Nevada, from Mariposa Co., Congdon, northward to Butte Co., thence crossing to similar altitudes in the inner Coast Range. Copiously collected by Mr. George Hansen in Calaveras and Amador counties in 1896, and distributed to various herbaria as a form of *E. cæspitosa.* His numbers 1539 in Herb. Calif. Acad. and in my own, as well as 1359, 1058, 1547, and 1596 in U. S. Herb., all represent this fine species at its time of full flowering. I have wished that this might be proven to be Bentham's *E. tenuifolia,* for that name would well beseem a species with foliage so finely cut. Nevertheless, the segments are far enough from being "subulate-linear," and the buds are as far from answering to the description, "obtusish, acuminate." Of course, the principal habitat of this plant was not reached by Douglas, on whose specimens the species was founded. But, as it comes down the inner Coast Range to Lake Co., if not even to Sonoma Co., I think Douglas may be thought to have reached this part of its habitat. But it still remains that these specimens do not answer the description of *E. tenuifolia.*

103. E. Elmeri. Annual, with many lax ascending branches from the base, a foot high or more, sparsely leafy with a small foliage, loosely floriferous, the peduncles all greatly elongated and not slender; herbage greenish and glaucescent, glabrous except as to basal parts, these scaberulous to hirtellous: leaf-divisions remote, each of 3 segments that are cuneiform and 3-toothed or cuneate-oblong and entire, the final segmentations acutish, or in some plants very acute: calyx 8 lines long, opaque, elliptic-oblong, abruptly and slenderly short-taper-pointed: corolla golden-yellow, subrotate, 1¼ inches wide: stamens many, filaments very short: stigmas 4, not slender, very unequal: pods 3 inches long, quite slender; torus funnelform.

Tassajara, Hot Springs, Monterey Co., Calif., June, 1901,

A. D. E. Elmer; his n. 3268, as in U. S. Herb. I also refer here with misgiving the following, all plants of similarly open leaf-segmentation, and like habit, but the specimens are all too poor to admit of free comparison with Mr. Elmer's which I name as typical. Herb. Calif. Acad., sheet 1026, from Point Sur, 1888, by Brandegee, sheet 2453, from Pacific Valley in the same county, by Miss Eastwood, 1893, sheet 2630, purporting to have come from Kelsey, Lake Co., June, 1889, by Brandegee. Besides these there is an old Whipple's Expedition specimen in U. S. Herb., which may have come from Monterey Co. It was collected by Bigelow, and, according to Torrey, Whipple Rep., p. 64, "at Knight's Ferry, on the Stanislaus River," very far from Monterey County, and in a very different region. The label bears, in Dr. Torrey's hand, the names *Eschscholtzia Douglasii*, var. *tenuifolia.* I doubt that the plant came from the Stanislaus, and believe it was from Monterey Co.

While *E. Elmeri* comes from the region where Douglas spent two seasons, and whence he sent seeds and specimens to England, it seems improbable that it can be *E. tenuifolia*, Benth. The calyx agrees, but the leaves do not.

104. E. INCISA. Annual, the long pedunculiform branches stout and apparently fistulous, a foot high, leafy only toward the base; herbage glaucescent, margins of petioles, petiolules and leaf-divisions sparsely crystalline-scabrous or denticulate: leaves mostly basal but forming only a loose tuft, the about 5 divisions rather remote, cuneiform, sparingly and incisely cleft into broad nearly parallel acute segments: calyx ½ inch long or more, the ovoid body surmounted by a falcate taper-point: corolla 1½ or 2 inches wide: stamens about 20, the subulate filaments shorter than the long linear anthers: stigmas 4, of which 2 are very long and slender, 2 very short: torus short, turbinate.

Uncommonly distinct species, known to me in but one fine large flowering plant in Herb. Parish, purporting to have been collected at the Soldiers' Home, Los Angeles Co., Calif. by Dr. H. E. Hasse, April, 1890.

105. E. FORMOSA. Large subacaulescent annual, often a foot high, the one or two scapiform peduncles and few short sparsely leafy branches from a tuft of comparatively small, often depressed basal leaves, these and the angles of the peduncles at base sharply scabrous denticulate, the whole plant quite glaucous: leaves cut into many short acutish and even very small segments: calyx ½ inch long or more, ovate-conic, short taper-pointed, very thin: deep yellow corolla subrotate, more than 2 inches broad: stamens about 20, filaments very short, subulate: stigmas 4, of which 2 are greatly elongated, 2 very short: pods 2 inches long, rather slender: hyaline inner margin of torus uncommonly prominent: seeds unknown.

On the last day of March, 1895, I discovered this *Eschscholtzia* in an obscure valley—that of Dry Creek—among the mountains between Napa and Sonoma Counties, California. Mr. C. F. Baker's n. 2614, from Mt. St. Helena, in the same region, appears to be the same. For this section of the genus the species is a very large and handsome one. It is far more nearly acaulescent than *E. cæspitosa* or *tenuissima*, and others of that habit. Contrary to the habit of those, this plant has its earliest and strictly scapiform peduncle longest; the sparsely leafy branches around it never, with their also long peduncles, together equaling the height of the first and scapiform one. The plant is doubtless of short duration. The specimens—both mine and those of Mr. Baker—seem to give no promise of a continued growth throughout the summer season; and in this are unlike most annual species.

106. E. DOLICHOCARPA, Eastw. Bull. Torr. Club. xxx, 487. Subacaulescent annual with stout quadrangular and striate scapiform peduncles far surpassing the tufted foliage, and 6 to 10 inches long: leaves with petioles more or less strongly scabrous-ciliate, the whole plant glaucous: leaf-segments oblong or linear, mostly short, divergent, obtuse: corolla yellow, larger, 2 inches wide: capsule 4 or 5 inches long: seeds ovoid, acute at both ends, lightly reticulate.

Remarkably large and large-flowered plant for one of this group known only from the Santa Lucia Mountains, California.

107. E. RHOMBIPETALA. Greene, Bull. Calif. Acad. i. 71; Fl. Fr. 287. Subacaulescent annual a few inches high, copiously leafy, glaucous and crystalline-scabrous throughout: blades of the long-petioled leaves small and compact, the segments mostly oblong, acutish, not notably divergent: corolla hardly an inch wide, cruciform, the petals rhombic-ovate, fugacious: pods as long as the leaves and peduncles, usually 3 or 4 inches: seeds large, very regularly and definitely favose-reticulate.

Low and wholly inconspicuous grain-field species, common from Colusa Co. far southward along the foothills of the inner Coast Range and plains adjacent; the flowers seldom seen, the petals falling before noon.

108. E. LEMMONII, Greene, West. Am. Sci. iii. 157; Fl. Fr. 287. Subacaulescent annual 6 or 8 inches high, with many early peduncles scapiform and little exceeding the leaves, obscurely quadrangular; branches, petioles and peduncles papillose-hirsute, leaf-segments scarcely so, torus glabrous, but calyx hoary-subtomentose, as also the growing ovaries after flowering: calyx thin under the hoariness, ovate-lanceolate, the distinction between the ovate body and the equally long beak-like apiculation not pronounced, the whole ¾ inch long; torus tubular and long, a little constricted under the delicate margin: corolla an inch or more in breadth, deep yellow: stigmas 4, very unequal: pod and seeds unknown.

Ver. LAXA. Loosely branched, only the one earliest peduncle scapiform; pubescence both short and scanty, only a trace of it on the pods and the calyx not hoary, this narrowly ovate-conical; torus not constricted at top, inclining from tubular to funnelform: pod 2½ inches long; seed not seen.

Var. CUSPIDATA. Quite as nearly acaulescent as the type, stouter, much less pubescent; terminal leaf-segment broad and

cuspidately acute: flowers larger, the bud 1¼ inch long; torus tubular-funnelform; calyx ovate-conical with an abrupt short point, very thin, scantily hirtellous.

The type of this remarkable species, obtained by Mr. Lemmon at Cholame, San Luis Obispo Co., Calif., as long ago as 1887, has not yet been rediscovered. The var. *laxa* is different habitally, is much less pubescent, and the flowers are larger and paler. It is quite possible it may demand specific rank when all the allied forms are better known. It is from Alcalde, Fresno Co., by Miss Eastwood, 10 May, 1893. Type in Herb. Calif. Acad. The var. *cuspidata*, though from a station less removed from the habitat of the type, I am loath to leave in the rank of a new variety, an account of its very different calyx. It is from San Lnis Obispo, and was collected by Mr. L. Jared in 1893. Specimens in Herb. Calif. Acad.

109. E. LOBBII. *E. tenuifolia*, Hook. Bot. Mag. t. 4812, not Benth. Subacaulescent annual not very slender, densely tufted and upright, 6 inches to foot high, glabrous, or at base very sparsely scaberulous, the herbage greenish and hardly glaucescent: earliest leaves narrowly lance-linear, very acute, entire, the many and tufted later ones mostly quinate (a few ternate), cut into 5 divisions, of which the lower are simply ternate, the terminal simple, all segments linear or lance-linear, elongated, acute: scapiform peduncles numerous, mostly well exceeding the foliage, quadrangular though often obscurely so, an intermediate elevated line on each face almost prominent as the angles: calyx 4 lines long, not striate, ovate-conical, very acute but not apiculate: corolla rotate, an inch wide: stamens about 16 or 20: pods 2½ or 3 inches long, stoutish: seeds densely clothed with brown papery lamellae and therefore bur-like.

This interesting plant, which I take pleasure in dedicating to memory of William Lobb, who was a collector of Californian seeds for Veitch of England more than a half-century ago, through whom the plant became known in England. The elder

Hooker, who published the plate cited, erred widely as to the plant's being identical with *E. tenuifolia*, Benth., to the description of which it does not at all answer, the leaf-segments being far from "subulate-linear," besides, Douglas neither collected nor saw this plant, which is of the foothills and plains of the interior valley toward the Sierra Nevada. The specimens are few, namely, a sheet in my own herbarium from northwestern Solano Co. by Jepson; another in Herb. Calif. Acad. from plains and hills of Butte Co., by Mrs. Bruce; a third in the same herbarium from Ione, Amador Co. by Brandegee. It appears to be associated, usually, with the next, which is very common in the same region, and of which I can not forbear suggesting it may possibly be a mutation. The plant is not at all glaucous; and in this respect, the plate cited misrepresents it.

110. E. PULCHELLA. *E. tenuifolia*, Greene, Bull. Calif. Acad. i. 70, not Benth., also *E. cæspitosa*, Greene, Fl. Fr. 287, partly (excluding reference to plate in Bot. Mag.), not Benth. Plant of half, or less than half the size of *E. Lobbii*, much more slender, commonly scaberulous or even hirsutulous near the base; earliest entire leaves linear-filiform and the segmentation of the later form narrowly linear to fairly filiform; scape-like peduncles very slender, sharply quadrangular, the elevated line between two angles obscure or obsolete: calyx broadly ovate, distinctly and sharply taper-pointed, the whole obviously striate with dark lines: pods 1½ to 2 inches long: seeds lamellate and bur-like.

Small and beautiful species, plentiful among the lowest foothills of the Sierra Nevada bordering the northern half of the interior valley of California, from Butte County southward to Amador and Fresno; scores of sheets in all the herbaria, many of them bearing my manuscript name since 1894 when at Kew I learned that it was none of Bentham's species founded on Douglas' material. If *E. pulchella* was ever grown in Europe—of which there is no evidence—it would probably have been

from seeds sent by Lobb; and I do not think the species would produce seed in that climate; so that even *E. Lobbii* was doubtless extinct there after one season.

In 1893 I was careful to obtain seeds of this denizen of the dry and heated foothills of the interior, and to plant them in the open ground by the seaboard. The plants grew well and produced flowers in the richest profusion there, yet not a pod was formed, or even a growing ovary observed.

111. E. UNGUICULATA. Annual, sometimes small and depressed when upright 6 to 10 inches high, all parts very slender, the long petioles, and even the scapiform peduncles at flowering filiform, sharply quadrangular, the intervening line distinct but not prominent: many earliest leaves linear-filiform and simple, succeeded by others with 3 segments at tip, the segments of all linear-filiform or acerose: calyx narrowly oblong-conical with distinct short apiculation: petals all narrow, somewhat rhombic-obovate, tapering to a broad and short but distinct claw: pods very slender, 1½ inches long: seeds as in the last.

Known mainly by a single sheet of good specimens in Herb. Calif. Acad., collected long ago—the year not mentioned—at Madera, Calif. by Mr. Buckminster. There are also two specimens of the same mounted, along with one of *E. Lobbii*, all thought to have been obtained at Ione, Amador Co.

112. E. GLYPTOSPERMA, Greene, Bull. Calif. Acad. i. 70. Glabrous, very glaucous, densely cæspitose, annual 3 to 6 inches high, seeming acaulescent, only the slender terete peduncles rising above the tuft of leaves; these of rounded outline, somewhat pedately ternate, rather fleshy, cut into long linear little divergent segments: calyx 4 to 5 lines long, broadly ovate—conic, shortly taper-pointed: corolla rotate, an inch wide: stamens 30 or more, of long anthers on shorter slender-subulate filaments: pod 1½ inches long, not stout, very glaucous and striate; inner margin of torus not hyaline, pergamentaceous rather: seeds spherical, grayish, marked with rounded shallow pits and with no reticulation.

Originals from the Mohave Desert, California, by Mrs. Curran,

but now in hand from desert regions adjacent in northern Arizona and southern Nevada and Utah, chiefly of Mr. M. E. Jones' collecting. An anomaly in *Eschscholtzia*, by its peculiar habit and sculptured seeds.

A NEW PAPAVERACEOUS GENUS.

PETROMECON.

Diminutive rigidly upright shrubs of dendroid habit with few stout densely leafy branches and solitary, pedunculate flowers in some axils and at the forks. Leaves alternate, dissected, but pedately, not pinnately. Calyx calyptriform, deciduous. Petals 4, deciduous. Stamens 80 or more: filaments very long, filiform above a flattened base; anthers much shorter, linear. Stigmas 2 or 4, not greatly elongated, clavellate. Pod long and 2-valved but hard and subligneous, the valves fluted. Torus a hemispherical subligneous cup, bearing petals and stamens on a thickish corky elevated inner margin, the outer a mere thick herbaceous ring. Seeds with no superficial papery coat, appendage or reticulation, but the surface uneven by short interrupted subsinuous rugosities.—Two known species, inhabiting shelving rocks on the almost inacessible slopes of Guadalupe Island; having something of the habit of the dendroid insular Eschscholtzias, but a pedatifid foliage, and flowers of *Stylophorum*, as to the excessive number of stamens on long filaments. The torus and the stigmas approach those of *Eschscholtzia* but are different, as are also the seeds.

P. PALMERI. *Eschscholtzia Palmeri*, Rose, Contr. U. S. Herb. i. 23. Very robust, 2 to 4 inches high including the 2-inch long pods, of compact and rounded dendroid habit, the spread of the few branches equalling the height of the plant: leaves fleshy, very glaucous, glabrous: calyptra almost spherical, with very short blunt point: corolla an inch wide, rotate, the broad petals overlapping below the middle: stigmas 2.

The largest type specimens in U. S. Herb. are plainly mere branches broken off from small bushy and rigid plants ; branches showing flowers and fruits. Two specimens, next in point of size, show the whole of as many small plants and their fusiform roots. One of these exhibits below its dense bunch of leaves and flowers the denudate growth of the preceding year. On another is shown the growth of two preceding years. No part of the plant dies back ; hence it cannot be called suffrutescent. The species is a diminutive tree-shaped proper shrub. That certain other specimens only an inch high, each with its corolla as large as all the rest of the plant, are flowering the first year from the seed is nothing strange. Every perennial *Eschscholtzia*, under ordinary conditions, begins flowering a few months after germination and while still stemless.

Duplicates of this plant were sent me, years ago, by Mr. Rose, soon after his having published it ; and my first thought, on seeing them was, that he had placed it in a wrong genus: that it must needs be a *Hunnemannia*. An inspection of the parts by help of a lens convinced me that it was not of that genus. Recently, having felt unable to reconcile the plant with *Eschscholtzia*, I had named and defined it as a generic monotype when I came upon the following.

P. FRUTESCENS. Much larger than the preceding, a foot high and as broad ; growing branches and their foliage less succulent ; older and naked branches wholly and solidly woody, the wood firm, compact and hard : leaves ample, on long and slender petioles, pedately divided and cleft into long narrow-linear moderately divergent segments : calyx ovate-conic : corolla cruciform, the cuneate-obovate petals not meeting : stamens as in the last ; stigmas 4, rather short, equal : pods and seeds not known.

Rocky ledges on the northern slope of Guadalupe, January, 1893, Dr. E. E. Franceschi; type in Herb. Calif. Acad., mounted with small specimens of *Eschscholtzia ramosa.*

A Study of Dendromecon.

Having concluded a prolonged and laborious investigation of *Platystemon* and *Eschscholtzia* and their nearer allies, I have been unwilling to leave the subject of the West American Papaveraceæ, without having made careful inspection and comparison of such material of *Dendromecon* as was at hand.

This is a genus much more restricted in its habitat than either *Platystemon* or *Eschscholtzia*; the latter occupying, according to my rough estimate, about three times as much territory as *Dendromecon.* And while the herbaceous genus scatters its species over all plains as well as mountain slopes, each secluded mountain valley, every stretch of broad and sunny plain, even every one of several separate and remote deserts of different soil and diverse in altitude—all and each of these, as well as all intervening mountain ranges, isolated or connected, has its *Eschscholtzias*, and in profusion. *Dendromecon*, on the other hand, is not only limited, apparently, to the one State of California, but is even there confined to the bushy slopes of hill and mountain sides. And, in so far as I have observed, it never grows in masses or forms thickets by itself. One bush here, another yonder, and not many seen in a whole day's journey, is my impression as to the distribution of these interesting shrubs.

Up to this date only three species of *Dendromecon* have been proposed; *D. rigida*, Benth., *D. Harfordii*, Kellogg, *D. flexilis* Greene; the latter so obviously and so totally distinct from the other two that any botanist denying its title to the rank of a species exposes himself to a suspicion of taxonomic incompetency, or else to that of being ruled by personal rather than phytographic motives; the latter, a course taken by some, and that very unequivocally, and in such wise that he who runs may read that motive. There is no botanist living, either in Cali-

fornia or Massachusetts, who, had he been shown the leaves alone, of *D. flexilis*, would ever had guessed that this foliage was that of any *Dendromecon*. There is not the least generic likeness between this leaf and that of *D. rigida* or even of *D. Harfordii*; and in the seventeen species of *Dendromecon* which I now find it necessary to outline, there is much diversity of habit and as many clear and constant characters of foliage as will be found to exist in an equal number of generally accepted species of *Prunus*, *Rhamnus*, or *Cratægus*, and greater differences than those subsisting between any seventeen species of *Alnus*, *Amelanchier*, or *Lonicera*.

The distribution of the species is most interesting. It seems to indicate a maritime origin for the genus; for the seven hundred miles of the Sierra Nevada foothills, farthest inland, yield but four of the seventeen species. The coast ranges and their southern spurs or extensions, all within what we know as the sea-fog belt, and near the sea, furnish us eight; while that nearly infinitesimal fraction of *Dendromecon* territory, the little seagirt islands off the coast, among themselves supply the other five.

Leaves very rigid, erect or suberect, strongly marked by an elevated venation and reticulation.
  Leaves of a light somewhat yellowish green, merely glaucescent.
    Peduncles slender, equalling or surpassing the foliage;
      Shrubs loosely and irregularly branched;
        Leaves lanceolate or ovate-lanceolate, cuspidate-acute, erose-denticulate........ 1 *D. rigida*.
        Leaves linear lanceolate, caudately acuminate, with elongated reticulation........ 2 *D. caudata*.
        Shrub compactly and fastigiately branched; leaves triple-nerved, less notably reticulate.. 3 *D. fastigiata*.
        Peduncles stout, shorter than the large obovate-elliptic foliage........ 4 *D. Harfordii*.
  Leaves pallid, very distinctly glaucous; the veins flexuous, breaking into the reticulation.
    Peduncles slender, equalling or exceeding the foliage.
      Leaves ovate-lanceolate, very acute, erose-denticulate........ 5 *D. agnina*.

Leaves narrowly oblong-lanceolate, frequently acuminate, reticulation of both faces smooth.. 6 *D. salígna.*
Leaves elliptic, mucronately acute;
Leaves large, minutely denticulate, the reticulation low, that beneath muriculate-scabrous........ 7 *D. elliptica.*
Leaves erose-denticulate or entire, the reticulation delicate, smooth........ 8 *D. quercetorum.*
Leaves small, nearly white; reticulation elevated, that beneath scabro-puberulent........ 9 *D. pallida.*
Leaves very small, not very pale; reticulation scaberulous on both faces........10 *D. pumila.*

Leaves less rigid (except in n. 17) when thick and coriaceous pliable, the reticulation less obvious (except in n. 12) or even wanting.
Peduncles long, exceeding the leaves (except in n. 14).
Leaves broadly elliptic-oblong, nearly entire, the reticulation large, faint, smooth........11 *D. leiophylla.*
Leaves narrow, elliptic-lanceolate, thinnish but finely and distinctly reticulate........12 *D. herbacea.*
Leaves thinnish, very erect, with finely crisped margins and faint reticulation;
Leaves lanceolate-elliptic........13 *D. caesia.*
Leaves oblanceolate-elliptic........14 *D. densifolia.*
Peduncles short, not equalling the leaves;
Leaves feather-veined, devoid of reticulation;
Leaves thick, coriaceous but soft and pliable, very glaucous........15 *D. flexilis.*
Leaves thin, green, scarcely even glaucescent16 *D. rhamnoides.*
Leaves thick and firm, feather-veined, but with some reticulation........17 *D. arborea.*

1. D. RIGIDA, Benth. Trans. Hort. Soc. 2 ser. i. 407; Hook. Ic. i. t. 37; Torr. Bot. Mex. Bound, p. 32, also t. at least as to the right-hand figure; Greene, Fl. Fr. 284, partly. Leaves lanceolate or ovate-lanceolate, mostly 1 to 1½ inches long, cuspidately or even spinescently acute, erose-denticulate, coriaceous and very rigid, glaucescent, indistinctly trinervate and obscurely feather-veined, only a strong yellow-green reticulation of the whole of both faces conspicuous, this reticulation though elevated nearly or quite smooth; the attitude of all the foliage ridigly erect or at least ascending: pods 2 or 3 inches long: seeds said to be pyriform and smooth.

My opinion respecting the range of this type species of the genus it that occurs only in what is properly denominated southern California, namely, from Monterey County to San Diego, and in the coast ranges exclusively, where, however, it is not the only species.

2. D. CAUDATA. Shrub apparently slender and the branches not rigid, even the maturer dull-brown and striate rather than somoth and polished: leaves very hard and rigid, about 2½ inches long, linear-lanceolate, caudately acuminate, closely erose-denticulate, the 3 pairs of veins almost parallel, the lowest pair either vanishing at the margin above the middle or more continuous, the uppermost pair running to the apex of the leaf, are irregular but always elongated, reticulation occupying intervening space, this conspicuous on both faces, smoothish above, closely muriculate-scabrous beneath: neither flowers nor pods known.

Collected somewhere in California, probably in the region of San Luis Obispo, by Mrs. R. W. Summers in 1884; type in U. S. Herb., to which it was communicated as a duplicate from Herb. Parke, Davis & Co. of Detroit. There is a recent and better specimen in U. S. Herb. from the Tassajara Hot Springs, Monterey Co., by A. D. E. Elmer, June, 1901.

3. D. FASTIGIATA. Shrub with remarkably stout, rigid fastigiately crowded short branches, their bark straw-colored, smooth and somewhat polished: leaves hard and rigid, the largest 3 inches long, lanceolate, the smaller and fascicled ones more narrowly lanceolate, all pungently acute, marginally somewhat crisped as well as denticulate and distinctly 3-nerved from base to apex, the nerves parallel, well back from the margin in the larger, very near it in the smaller; reticulation distinct on the upper face, less so on the lower, all of it little elevated and perfectly smooth: calyx spherical: corollas ¾ inch wide.

San Gorgonio Pass, mountains of Southern California, 4 April, 1898, J. B. Leiberg; type in U. S. Herb.

4. D. Harfordii. Kell. Proc. Calif. Acad. v. 102, mainly; Greene, Bull. Torr. Club, xiii, 217; Gray, Syn. Fl. i. 87 in small part only, excl. syn. *D. flexilis.* Very stout, low shrub, the branches short, rigid, hidden by the erect and imbricated large stiff foliage: leaves obovate-elliptic, 2 or 3 inches long, 1 to 1½ inches wide at the widest part a little above the middle, very rigid and hard, cuspidately acute by a hard almost woody point, entire, prominently feather-veined and reticulate, both veins and veinlets perfectly smooth: neither pods nor seeds known to the present writer.

The shrub the vegetative characters answer the above description is, I believe, known only as collected by Mr. Harford on Santa Rosa Island in 1872; who also at the same time collected fair material of what I long afterwards obtained on Santa Cruz Island, and published as *D. flexilis;* and it is now plain that Dr. Kellogg confused the two. I now see that his expression "roundish to subcordate ovate" in reference to the foliage, is derived from that of *D. flexilis*, a Santa Rosa specimen by Harford being at the moment before me. I have no evidence that Mr. Brandegee detected this species while on Santa Rosa. Two sheets of his specimens, so labelled, in U. S. Herb. show no trace of *D. Harfordii;* and what I said of this shrub in 1886 is incontestable. It bears no intimate relation to *D. flexilis*, but, on the contrary, is next of kin to *D. rigida* itself. Its exceedingly hard-coraceous and upright foliage, strongly reticulated, also yellow-green and almost free from bloom—all these are points absolutely decisive of its close relation to *D. rigida.*

5. D. agnina. Leaves small, coriaceous, and very rigid as well as erect, much diversified as to outline, those lowest on the flowering branches only ¾ inch long, oval, obtuse, the greater number, 1 to 1½ inches long, ovate-lanceolate, very acute, but not cuspidately or pungently so, minutely erose-denticulate, rather evidently slenderly feather-veined, the reticulation manifest on both faces but not prominent, rather very fine and low, altogether smooth: corolla 1¼ inches wide: pods 2½ inches long.

Known only from the Santa Inez Mountains behind Santa Barbara, by G. W. Dunn, 22 May, 1891; type in U. S. Herb. Most like *E. rigida* in leaf-outline, but in that one particular only; unlike it in other important characters.

6. D. SALIGNA. Leaves narrowly oblong-lanceolate, 2 to 3½ inches long, abruptly and pungently acuminate, obscurely or not at all denticulate, hard and rigid, indistinctly and flexuously feather-veined, but veins and veinlets breaking into an irregular and smooth reticulation: corolla 2 inches wide: pods 2½ inches long: seeds round-pyriform, marked with an unusually coarse favose reticulation.

Encenitas, California, T. S. Brandegee; type in U. S. Herb., where, by the way, Mrs. Brandegee has attributed the specimens to Lower California. Mr. Brandegee (Zoe. i. 47) reports that this is a shrub six to ten feet high, with much the habit of *D. flexilis;* and perhaps its real affinities may lie with some insular species, but if so, with *D. arborea* rather than with *D. flexilis.*

7. D. ELLIPTICA. Evidently a larger, more luxuriant and leafy shrub than *D rigida* and wanting its yellow-green hue, pale and very glaucous, also less rigid: leaves mostly exactly elliptical, 2 or 2½ inches long, mucronate-acute, closely and finely denticulate; reticulation distinct but little elevated, smooth as to the upper face, sparingly muriculate scabrous as to the lower: corolla little more than an inch wide: pods 4 inches long, marked by uncommonly strong ribs and alternating furrows: seed small; nearly spherical, marked with a slightly elongated minute reticulation running somewhat in lines.

Common in mountain districts of all southeastern California, from the valley of the Kaweah, Coville & Funston, and middle Tule River, Purpus, to Waterman Cañon, San Bernardino Mountains, Parish, and the Lower California boundary at Campo, San Diego Co., Calif., G. R. Vasey; all these specimens typical, as in U. S. Herb.

8. D. QUERCETORUM. Leaves oblong or oblong-elliptic on flowering branches and about 2½ inches long, those of sterile shoots exactly and rather narrowly lanceolate, about as long, all mucronately acute, erose-denticulate or entire, very glaucous, thinnish but coriaceous, the feather-veins all breaking into and forming part of the very conspicuous though rather delicate reticulation, this smooth on those of old shoots, scabrous on those of new ones: corolla nearly 2 inches wide: pods 2¼ inches long, more slenderly pointed and less strongly ribbed than in the other species.

Shrub common among the hills of the San Francisco Bay region and northward, doubtless occurring in the Sierra foothills, also, northward. The type is a shrub of my own collecting on the Oakland Hills, 21 Aug., 1888; the same also, but in young leaf, and copiously flowering, Mt. Tamalpais, 3 March, 1889. Its glaucous foliage, with also a far more delicate and less elevated pale reticulation, no less than the size and the outline of the leaf, distinguish it from *D. rigida*, and other characters, I doubt not, will be detected in further confirmation of this species of the northerly habitat.

9. D. PALLIDA. Low shrub with few and stout rather densely leafy branches, each with a rather long terminal peduncle: leaves hard-coriaceous and very rigid, almost white with bloom, ¾ to 1½ inches long, from obovate in the lowest, to oval, ovate-elliptic and elliptic, pungently acute, only the midvein unbroken, all the lateral nerves soon merging themselves in the very prominent and regular low reticulation, this on the lower face minutely scabro-puberulent: pods 2 inches long: flowers and seeds not seen.

Mt. St. Helena, middle California, 29 June, 1889, T. S. Brandegee; type in U. S. Herb. Probably from near the arid summit of the mountain, on some open slope looking southward; the almost white and somewhat bullate-rugose as well reticulate foliage recalling that of some shrubby salvias.

10. PUMILA. Rigidly shrubby and intricately branched dwarf, apparently 8 or 10 inches high including the small pods all on terminal peduncles: leaves ovate-lanceolate to elliptic, acute by a recurved mucro, ¼ to ½ inch long, pale, reticulate, the veins and meshes on both faces minutely scaberulous: corolla ¾ inch wide: pods 1 to 1½ inches long.

Mt. St. Helena, Napa Co., Calf., April, 1889, T. S. Brandegee; type in U. S. Herb. This interesting dwarf is guessed by me to have come from perhaps the very summit of this culminating point of the middle Californian Inner Coast Range. The knotted and gnarled lower branches bear lichens in evidence of the under shrubs' inhabiting a height where the summer fogs, which prevail in the coast ranges, come early in the day and stay late.

11. D. LEIOPHYLLA. Leaves coriaceous on mature branches, but not very rigid, ascending, 1½ to 2½ inches long, rather broadly elliptic-oblong, mucronate-acute, entire, or now and then with some obscure denticulation, only two lateral veins manifest and these more or less tortuous as partially circumscribing the coarse and altogether faint low smooth reticulation; leaves of young plants much thinner and larger, oval, 3 inches long, 2 in breadth, showing usually a few coarse serrate teeth towards the apex, the feather-veins more numerous if not more distinct, the reticulation not formed, only foreshadowed by various delicate elevated lines; buds globose: corolla 1½ inches wide.

Fine species of the Sierra Nevada, represented in U. S. Herb. by a specimen from Cherokee, Butte Co., by Mrs. Bidwell, May, 1879, and two from near Alta, by Brandegee, July, 1889, one of these from a robust seedling, showing the toothed foliage mentioned by Brandegee in Zoe, i. 47, whose account of the young seedling plants, by the way, is one of the most interesting facts hitherto published concerning this remarkable genus. In so far as I know, Mr. Brandegee is the only one who has seen the cotyledons of *Dendromecon*.

D. leiophylla, though not of the Coast Range at all, but of the remoter inland range, is next of kin to the strictly insular *D. flexilis;* and there is no coastal Dendromecon that makes any near approach to either: not even the *D. saligna* of the seaboard in San Diego Co., for that has the hard rigid strongly reticulated foliage of the *E. rigida* group.

12. D. HERBACEA. Apparently not even suffrutescent, the long flexible and sparsely leafy stems 1½ feet high from a ligneous crown, parted at summit into several long weak peduncles, the whole very pale and glaucous: leaves elliptic-lanceolate, very acute, those next the base of the stem smaller, tapering to a distinct and not short petiole, the others subsessile, ascending, 1½ to 3 inches long, thinnish but beautifully reticulate, only the midvein remaining unbroken: calyx subglobose inclining to pyriform: corolla golden-yellow, less than an inch wide.

Foothills of the northern Sierra Nevada, near Pit River Ferry, Shasta Co., May, 1897, H. E. Brown; type in U. S. Herb. This is the most northerly *Dendromecon* of which I find record, and I think not accidentally but naturally and characteristically herbaceous: there being no shrubby species to which I can refer this foliage.

13. D. CÆSIA. Shrub somewhat fastigiate, densely leafy, the leaves very glaucous, lanceolate-elliptic, very erect, 1½ to 2½ inches long, obtusish, mucronate, the margin finely crisped in the young, entire in the mature, only the midvein prominent, two lateral nerves from the base either continuous to the apex, or vanishing, a few feather veins even more obscure, reticulation obsolete: peduncles little exceeding the leaves: corollas half-inch wide.

Mandeville Cañon, in the Sierra Santa Monica, Los Angeles Co., Calif., 8 April, 1890, H. E. Hasse: in U. S. Herb. An excellently marked species, practically of the southern seaboard, more suggestive of *D. densifolia* of Santa Rosa Island than of any other; yet most distinct: the leaves somewhat fewer, of another outline, more veiny, more firm of texture, and with almost no reticulation.

14. D. DENSIFOLIA. Probably dwarf, all the branches short, stoutish, densely leafy with foliage ascending and imbricated on young shoots, less so on those older and floriferous: leaves of only subcoriaceous texture and decidedly glaucous, of oblanceolate-elliptic outline, or a few quite elliptic, obtusish, mucronate, a narrow and thinnish margin more or less revolute and crisped but not denticulate, the whole 1 or 2 inches long, finely feather-veined and reticulate, the reticulation not at all pronounced, rather faint, low, perfectly smooth: peduncles extremely short, not equalling the leaves even in fruit: pod barely 1½ inches long.

Known to me only as collected on Santa Rosa Island in 1888 by Mr. Brandegee, reckoned by him to be what he would call *var. Harfordii* of *D. rigida*, but, as I have intimated above, not at all related to *D. Harfordii*, only imitating that in habit. The foliage here is remarkably thin, recalling that of some ericaceous shrubs.

15. D. FLEXILIS, Greene, Bull. Torr. Club. xiii. 216. *D. Harfordii*, Kell. l. c. in small part. Arborescent, 6 to 20 feet high, not rigid, the branches often drooping with the heavy weight of a dense mass of coriaceous foliage: leaves of mature branches typically oblong-obovate, about 2 inches long, obtuse or acutish, mucronate, perfectly entire, strongly glaucous on both faces as well as finely and closely feather-veined, but with no trace of reticulation, the texture strongly coriaceous but pliable, not rigid; leaves of vigorous young shoots broadly oblong-elliptic, some more than 5 inches long and 3 in width, no foliage erect or even ascending, usually widely spreading: peduncles numerous, axillary, short, never equalling the leaves: corolla 2 inches wide: pods usually 3 inches long: seed spherical, very finely reticulate, not large, the caruncle apparently entire and cup-shaped.

Ten years before my own discovery of this most remarkable papaveraceous tree on Santa Cruz Island, Dr. Rothrock had brought a branch of it from the same island; this now pre-

served in U. S. Herb. The collector supposed it to be *D. rigida*; or, more probably, was told by some one that this was the name. His label bears record to its attaining the height of twenty feet, which is much larger than the largest seen by me in my very imperfect survey of the vegetation of Santa Cruz.

I observe, furthermore that in this earliest known specimen the leaves differ in two points from those of my type as here anew described; they lack all trace of the obovate in outline, and are elliptic-oblong, with also no obscure hint of the reticulation. Specimens of my own also, forming a part of my duplicates of *D. flexilis* have a still more rounded leaf, with texture firmer, and sufficiently evident reticulation: so that I begin to be apprehensive that the *D. flexilis* as I had it, and still have it, may prove an aggregate of two species.

16. D. RHAMNOIDES. Size and habit of *D. flexilis*: leaves large, 2 to 4 inches long, broadly oblong or oval, obtuse, with very prominent narrow cusp or soft mucro, the texture not even coriaceous, marked with many pairs spreading veins all low and delicate, and devoid of all reticulation, the margin entire: peduncles even in fruit not half the length of the leaves: corolla about 1½ inches wide: pods 3 inches long: seeds unusually small, nearly spherical, very slightly inclining to pyriform, the reticulation coarser than usual, very distinct.

Island of San Clemente, June, 1903, Mrs. Trask; distributed to U. S. Herb. under n. 252 and the name *D. flexilis*, which this new species recalls in habit only. Its leaves are not only green (not even glaucescent), but as thin as those of *Rhamnus Purshiana* nearly, not as thick as those of *R. Californica*. In this particular the species is most remarkable.

17. C. ARBOREA. Arboriform, 10 to 20 feet high, with trunk 5 inches to a foot in diameter: branches densely clothed with coriaceous glaucous rigid and ascending rather than spreading foliage: leaves mostly 2 inches long, rather broadly elliptical, acutish, stoutly mucronate, entire, or with here and there some

definite minute denticulation, freely feather-veined and faintly reticulate, the veins and veinlets with here and there a trace of scaberulous roughness, but mostly quite smooth: peduncles rather slender, but hardly equalling the leaves: corollas at their best more than two inches wide: filaments rather narrow: pods 3 inches long, slenderly beaked under the large stigmas.

Local on a volcanic cliff on Santa Catalina Island, March, 1896, Mrs. Trask; type specimens in my own herbarium. The leaves here are firmer, though not as thick as in *D. flexilis*, a species which also seems to inhabit Catalina.

Suggestions Regarding Sanguinaria.

In but two localities—but these rather remote from one another—have I had opportunities for gaining any familiarity with this beautiful and interesting genus. Many years ago, in southern Wisconsin, I knew well its haunts, and sought it out every spring at its flowering. After that, for more than twenty years, my herborizations were always beyond its range.

In 1896, in woods of the District of Columbia, I was delighted with the copiousness of *Sanguinaria* as it came into flower in the latter part of March; and I was at first strongly impressed by the fact that these were not such bloodroot flowers as I had been used to see in Wisconsin; and the difference was one easy enough to name. The corolla here was quadrate, and of very numerous petals. That of the Western woods I knew had been circular in outline, and made up of not much more than half as many petals.

And now, after ten seasons of observation on the plant as it occurs plentifully about Washington, I have looked into the herbaria to see what proof I might find there of notable differences in *Sanguinaria* as it comes in from different sections of the country; and I seem to find, as usual, more there than I had expected. Then, going from the herbarium to the old standards of early American botany, I have been greatly surprised to find

that even as long ago as the year 1732 Dillenius published two species of bloodroot, one of them in two varieties, and that Linnaeus himself gave out the one species *S. Canadensis* under three varieties.

The following suggestions of an extension of the genus may doubtless invite and direct a much needed investigation of it.

1. S. Canadensis, Linn. Sp. 505, excluding varieties β and γ. *S. minor*, etc., Dill. Elth. t. 252. fig. 327? Marked by a smaller and orbicular corolla of 8 petals or fewer; but mature foliage much the largest in the genus, often 8 inches wide, constantly broader than long, the 7 lobes coarsely toothed.

Occurs throughout New England, Canada and northern New York.

2. Dilleniana. *S. Canadensis*, vars. β and γ, Linn. l. c. *S. major*, Dill. l. c. Marked by large corolla of notably quadrangular outline the petals 10 to 16, of which 4 are much larger and longer; mature foliage never large in proportion, the lobes themselves 3-lobed, not coarsely, or even in any wise notably toothed, the whole leaf as long as broad.

From New Jersey and Pennsylvania southward to North Carolina, also apparently westward along the Ohio to Missouri.

3. S. australis. Rootstock less fleshy, apparently even hard and with much woody fiber, the fibrous roots more copious and finer: leaves not large, lobed to below the middle and the lobes coarsely toothed rather than lobed: pods short and thick, borne on peduncles that far supass the leaves.

South Carolina to Alabama, collected by Ashe and by Mr. and Mrs. Earle. In all our more northerly bloodroots the long pods are borne beneath the leaves, so short are their peduncles.

4. S. rotundifolia. *S. Canadensis*, var. β, Wood, Bot., p. 222 (ed. of 1866)? Mature leaves not even glaucescent above, but of a rich deep green, beneath very glaucous, the outline sub-

orbicular but largest below the middle and the basal sinus closed, none of the lobes either lobed or toothed, all broader than long, very obtuse or almost truncate, obscurely undulate, or quite entire.

A Georgian species, rare and little known. According to Wood,—supposing his plant to be the same I have described—the leaf is sometimes without lobes: such plants probably young. My type is Mr. Harper's n. 1146, from near Americus, Ga., 1901. The rootstock here, as in *S. australis*, appears to be hard-fibrous rather than succulent.

5. S. GRANDIFLORA, Sweet, Fl. Gard. 2 Ser. t. 147. This seems likely to prove a valid species; for, although from "Carolina," it can hardly displace either of my names here proposed for southern plants. Its rootstocks are indicated to be as fleshy as those of any of the northern kinds.

6. S. MESOCHORA. Corolla and large mature foliage of *S. canadensis*; rootstock stouter and very succulent: fruiting peduncle shorter: mature pod smaller by one-third, much more compressed, almost flat, not acuminate, of oblong-elliptic outline and merely acute.

Wooded slopes along bluffs of the upper Mississippi and its tributaries in Wisconsin, Iowa and Minnesota; type specimens as to fruiting stage recently sent from Winona, Minn., by Prof. J. M. Holzinger.

Extension of Osmaronia.

While yet resident on the Pacific Slope of the Continent, I became apprehensive that the genus *Osmaronia* would eventually be found quite other than monotypic. I could not easily reconcile the low rigid copiously flowering and fruiting shrub of the hills about San Francisco Bay with the tall lax large-leaved sparingly floriferous type of the region of the Columbia River and Puget's Sound from 800 to 1000 miles northward; this doubt about the identity of the small bush persisting still, in the face of the fact the northern shrub or tree had been found along the borders of coastal woods well southward upon the northern half of California.

After the lapse of another ten years, and with the advantage of having before me much good herbarium material, the distinctions of the following become clear enough.

O. cerasiformis, Greene, Pitt. ii. 191; in small part only of Bay-Reg. Man. etc. Arborescent, commonly 8 or 10, occasionally 12 or 15 feet high: leaves 3 or 4 inches long, obovate to cuneate-oblong, acutish or obtuse, cuspidate-mucronate, thin and membranaceous even in maturity, more or less villous-tomentulose beneath at all stages, strongly so when young: pulp of mature drupes almost none.

Var. lancifolia. Leaves commonly 5 or 6 inches long, elliptic-lanceolate, ending in a long cusp-like point: pubescence and drupes as in the type.

Var. nigra. Leaves smaller, mostly 3 inches long, texture and pubescence of type: drupes with more pulp, without bloom and quite black.

This the type species of the genus is of the widest range, occurring from British Columbia all along the seaboard south-

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ward to northern California. It is not infrequent as far eastward as northern Idaho, but in the intervening mountain districts runs into the two marked varieties or subspecies indicated.

The variety *lancifolia* is from the Chilliwack Valley, being represented in n. 34,367 of the Canad. Geol. Surv., collected by Mr. J. W. Macoun.

That which I designated as variety *nigra* (in all likelihood a species) is from the upper Nesqually Valley, Washington, by O. D. Allen, the type in U. S. Herb.

O. OBTUSA. Habit of *O. cerasiformis*, with foliage of like thin texture and as large, but in outline oblong, not tapering cuneately, very obtuse, abruptly mucronate rather than cuspidate, whitish-veiny on both faces, uncommonly pale beneath and quite glabrous in age, perhaps pubescent when young; drupes not more fleshy than in *O. cerasiformis.*

At middle elevations in the foothills of the Sierra Nevada, Calif.; type George Hansen's n. 211 as in U. S. Herb. On the characters of the foliage alone this must be held as more than a mere variety of the last.

O. BRACTEOSA. Habit of the foregoing: leaves large, commonly 3 to 5 inches long, of very firm texture, exactly elliptical, acute but hardly either mucronate or cuspidate, very smooth and glabrous above, beneath scarcely paler and in no degree glaucous, but with a minute and sparse pubescence that is rather hirtellous than villous: fruiting racemes large and ample, the pedicels an inch long, subtended by rather narrow acuminate bracts almost as long: neither flowers nor mature fruit seen.

Salt Creek, Kaweah, Tulare Co., Calif., 25 April, 1895, Alice Eastwood; type in U. S. Herb. Thoroughly distinct from all other species not more by its long bracts than by texture, general outline and peculiar pubescence of its foliage.

O. DEMISSA. *O. cerasiformis*, Greene, Man. 110, mainly, not of Pitt. ii. 191. Low shrub, the stout rigid upright or ascending branches densely leafy and copiously floriferous, the whole

commonly 2 to 4 feet high: leaves small, oblong and obovate-oblong, or on vigorous sterile shoots obovate, 2 inches long or more, obtuse or acutish, mucronate, deep green above, glaucous beneath, glabrous throughout, firm in texture when mature, prominently and irregularly veiny, the narrow and callous margin revolute and somewhat crisped: racemes very short and few flowered, the flowers crowded; outer bud-scales as well as sometimes the inner and the bracts and calyx-segments more or less definitely ciliolate: drupes shorter and more rounded than in other species, blue with a dense bloom and the sarcocarp of considerable thickness.

Common along the borders of low thickets near streams among the hills encircling San Francisco Bay; the type specimens in my own herbarium collected mostly by myself at San Francisco and Berkeley. C. F. Baker's n. 317 from near Stanford University represents a state of it too large and luxuriant to be quite typical, yet with the essential characters, though there are only flowering specimens. Kellogg & Harford's n. 196, collected at Alameda in 1868, shows best the ciliation of bracts and calyx-teeth.

O. LAURINA. Apparently dwarf like the last, the racemes as short, dense and few-flowered; calyx-segments whitish and petaloid: young foliage oblong-lanceolate, obtuse, glabrous: mature leaves elliptical, 3 inches long, very firm, quite subcoriaceous, of a light yellowish green on both faces, smooth and without prominent venation: drupes glaucous, the pulp very thin.

Known only from the Santa Lucia Mountains, Calif., as collected by R. A. Plaskett in 1898. Very distinct by the marked peculiarities of its mature foliage.

O. PADIFORMIS. Low shrub, with foliage of the same hue and the thin texture of that of *O. cerasiformis*, also similarly pubescent beneath, but smaller, the largest leaves 2½ or 3 inches long, their outline almost elliptical, acute but hardly mucronate:

racemes long and drooping, fruiting copiously ; the drupes glaucous and with thick sarcocarp, almost like that of a plum.

Elevated hills of the inner Coast Ranges in Lake and Sonoma Counties, California; well represented in U. S. Herb. by Heller's n. 5859 from Lake Co., this to stand as the type; but I have little doubt the same collector's n. 5043 from the interior of Sonoma Co. is the same thing in flower. This, if nearest the type species as to general marks of foliage, is farthest from it as to its fruit.

ERRATA.

Page 14, for M. ASTRATA, read M. ATRATA.
" 17, line 8, for hastily, read hasty.
" 18, line 3. for dilicate read delicate.
" 19, line 10, for suffrutiscent, read suffrutescent.
" 20, line 20, strike out only.
" 27, line 8, for *V. negulosa*, read *V. rugulosa.*
" 55, line 18, for habitatly, read habitally.
" 66, line 12, for Oregon, read Organ.
" 108, line 5, for nearly, read merely.
" 108, line 6, for in, read on.
" 118, line 3, for by, read of.
" 141, line 10, for sepals and, read sepals 3.
" 141, line 11, strike out each.
" 146, line 15, for sepals and petals each six, read, sepals 3 ; petals 6.
" 251, line 19, for Cougdon, read Congdon.
" 298, line 9, for candately, read caudately.
" 298, line 12, for are, read an.

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